GATX

SENERAL AMERICAN TRANSPORTATION CORPORATION

AD 641701

NATURAL VENTILATION TEST OF AN ABOVEGROUND FALLOUT SHELTER IN CHICAGO, ILLINOIS

bу

R. H. Henninger C. A. Madson

GARD Report 1268-81

August 1966

Distribution of this document is unlimited.

TECHNOLOGY	I FOUSE' IENTIFIC AND
Pardcopy Microf	ا الشهرا
ARCHIVE	

GENERAL AMERICAN RESEARCH DIVISION.

7448 NORTH NATCHEZ AVENUE, NILES, ILLINOIS 60648 318/647-6000

Best Available Copy

DISCLAIMER NOTICE

THIS DOCUMENT IS BEST QUALITY PRACTICABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

Prepared for Office of Civil Defense Department of the Army, OSA under Work Unit 1214A

SRI Subcontract No. B-64220(4949A-16)-US

NATURAL VENTILATION TEST OF AN ABOVEGROUND FALLOUT SHELTER IN CHICAGO, ILLINOIS

by

R. H. Henninger C. A. Madson

GARD Report 1268-81

Distribution of this document is unlimited.

Reviewed by:

G. Engholm

N

)

QEnglolm

Group Leader Environmental Research 1,000ml

Approved by:

General Manager

OCD DISTRIBUTION NOTICE

This interim report describes environmental tests performed in a specific shelter. The discussion of the results is preliminary and should not be used as the basis for general conclusions. A subsequent final report will include a comparative evaluation of data from subsequent tests having a variety of configurations and locations.

FOREWORD

The natural ventilation tests reported herein were conducted by General American Research Division of General American Transportation Corporation,
Niles, Illinois, during the period of 12 July to 28 July 1965, under Stanford
Research Institute (SRI) Contract No. B-64220(4949A-16)-US. Mr. C. A. Grubb
of SRI monitored this Civil Defense project. The major objectives of this
shelter ventilation test program are: "(a) to evaluate parameters that determine
the resultant shelter environment, (b) to develop a rationale for estimating
minimum shelter equipment requirements, and (c) to obtain and correlate
experimental data in support of current or modified computational methods or for
direct use as empirical information". These tests were confined exclusively
to the evaluation of natural ventilation effects.

The authors wish to acknowledge the assistance provided by Mr. Walter Sterling, Housing Administrator and Mr. James Merutka, Superintendent of Fire Prevention and Safety for the University of Illinois, Medical Center Campus and also Mr. Philip Voegtle, Superintendent of Fire Prevention and Safety for the University of Illinois, Chicago Circle Campus. Through their efforts we were able to obtain the test site on the University's Medical Center Campus.

ABSTRACT

A 12-day natural ventilation test was conducted in a 275-occupant above-ground corridor-type shelter using wind forces only to supply ventilation air. This test is one in a series run to develop procedures to predict natural ventilation rates in aboveground shelters. An overall window ventilation efficiency (effectiveness factor) of 0.15 was determined experimentally with windows open on two walls. This effectiveness factor is independent of wind direction.

S

8

03 18

13

Ď

3

9

8

8

Based upon the experimentally determined effectiveness factor and a total openable window area of 119 square feet, the shelter will be adequately ventulated by natural ventilation 98.2 per cent of the days during the year. That is, in the Chicago area, the effective temperature of this shelter when occupied by 275 people at 10 square feet per person will not exceed 83°F for more than seven days during an average year.

TABLE OF CONTENTS

SECTION			Page								
	FORE	WORD	. ii								
	ABST	RACT	.iii								
1	INTR	ODUCTION	. 1								
2	DESC	RIPTION OF TEST SITE	. 2								
	2.1	Occupancy Level	. 2								
	2.2	Ventilation Openings	. 2								
	2.3	Shelter Surroundings	. 6								
	2.4	Radiation Protection	. 6								
3	INST	RUMENTATION	. 10								
	3.1	Temperature Measurement	. 10								
	3.2	Shelter Energy and Moisture Inputs	. 10								
	3.3	Wind Speed and Direction	. 13								
4	PROC	EDURES	. 14								
	4.1	Data Recording	. 14								
	4.2	Determination of Ventilation Rate	. 14								
5	TEST	RESULTS AND DISCUSSION	. 17								
	5.1	Directionally Dependent E-Factor	. 18								
	5.2	Overall E-Factor	- 20								
	5.3	Comparison of Local and Weather Bureau Data	- 20								
	5.4	Error Analysis	. 40								
	5.5	Adequacy of Natural Ventilation	. 42								
	5.6	Comparison of Ventulation Rates	. 44								
6	CONCLUSIONS AND RECOMMENDATIONS										
	REFE	RENCES	. 47								
	APPENDIX A										
	APPE	NDIX B	. Bl								
	A DEPUNTY O										

LIST OF FIGURES

Z.

Į,

18

Ž,

8

Š.

E.

Ĺ Ø

E.

22

Š

B

FIGURE NO.	Page
1	Exterior View of Student Residence Hall, Chicago,
0	Illinois
2	Shelter Floor Plan and Instrumentation 4
3 4	Typical Dormitory Room
4	Typical Shelter Windows
5	Plot of Buildings Surrounding Shelter
6	Views from Roof of Student Residence Hall 8
7 3	Exterior View of Northwest Corner of Student Residence Hall 9
3	Interior View of Shelter Corridor Looking from South to
	North11
9	Other Interior Views of Shelter Corridor
30	Wind Instruments
11	Correlation of Data for NW-N-NE Wind Sector21
12	Correlation of Data for N-NE-E Wind Sector22
13	Correlation of Data for NE-E-SE Wind Sector23
14	Correlation of Data for E-SE-S Wind Sector
15	Correlation of Data for SE-S-SW Wind Sector25
16	Correlation of Data for S-SW-W Wind Sector26
17	Correlation of Data for SW-W-NW Wind Sector27
18	Correlation of Data for W-NW-N Wind Sector28
19	Correlation of Data for All Wind Sectors29
20	Test 1 Temperatures and Wind Conditions
21	Test 2 Temperatures and Wind Conditions34
22	Test 3 Temperatures and Wind Conditions
23	Test 4 Temperatures and Wind Conditions
24	Test 5 Temperatures and Wind Conditions
25	Test 6 Temperatures and Wind Conditions
26	Tests 7 and 8 Temperatures and Wind Conditions39
27	Natural Mantilation Adams of Change Thinnis 12

LIST OF TABLES

TABLE NO.	Page
1	Summary of Shelter Tests
2	Direction Dependence of E-Factor (For F = 1.0) 29
3	Direction Dependence of E-Factor (For F = Factual) 30
l ₄	Measurement Error41

SECTION 1

INTRODUCTION

Ventilation tests of an aboveground corridor-type fallout shelter located in Chicago, Illinois, were performed during the month of July 1966 to determine air temperatures, humidities, and ventilation rates obtained using natural ventilation through existing windows and corridors. Shelter occupancy was simulated by the use of electromechanical devices (Simocs) which duplicate the sensible and latent metabolic output of shelter occupants.

ĝ

3

Throughtout all tests, hourly data were recorded on wind speed and direction, ambient and shelter temperatures and humidities, and psychrometric conditions. The window ventilation efficiency was then determined.

SECTION 2

DESCRIPTION OF TEST SITE

The shelter tested was a portion of the fifth floor of the Student Residence Hall located in Chicago at the corner of Polk and Wolcott Streets on the Medical Center Campus of the University of Illinois (see Fig. 1). The test area consisted of the north and south wings of a T-shaped corridor and included 21 single and double bedrooms with individual closet space (see Figs. 2 and 3). A temporary plastic and plywood partition separated the test area from the rest of the fifth floor.

2.1 Occupancy Level

The total useable floor area of the north and south wings is 5200 square feet; however, only the corridor (800 feet square) and approximately half of each dormitory room (the half away from the windows) provides a protection factor of 40 or more (see Section 2.4) and therefore was considered to be occupied by shelterees during the test. Hence, the maximum occupied floor area was approximately 2750 square feet. At an occupancy loading of 10 square feet per person, the maximum number of occupants is 275.

2.2 Ventilation Openings

The only ventilation openings present in the shelter are 41 identical 50 inch by 39 inch double-hung windows (wooden sash type). Each of the 20 double bedrooms has two windows (see Fig. 4) while the single bedroom has only one window. Twenty-four windows are located in the east wall and 17 in the west wall of the shelter. Throughout the test, the upper sash of each window was closed. The bottom sash has a total openable area of 5.8 square feet.

8

Ş

8

Ŷ

T.

ŝ

33

Î

(P

Ĩ.

(X)

7. 85

B

Figure 1 EXTERIOR VIEW OF STUDENT RESIDENCE HALL, CHICAGO, ILLINOIS

Figure 2 SHELLTER FLOOR PLAN AND INSTRUMENTATION

GRAPHIC PCALE DEST



(3)

Ŋ.

Ď

4. 833

Ŝ

E

Figure 3 TYPICAL DORMITORY ROOM



Figure 4 TYPICAL SHELTER WINDOWS

Although stairwells are present at both ends of the corridor, they could not be used as ventilation openings since the other floors in the building were occupied by students during the entire test.

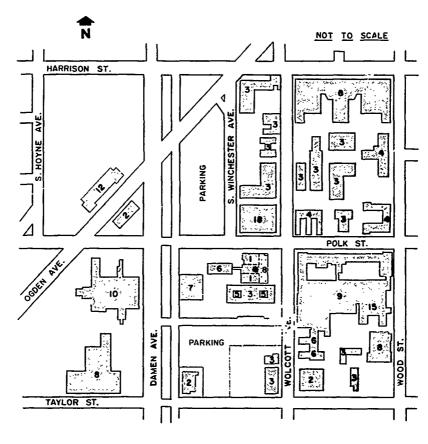
2.3 Shelter Surroundings

Fig. 5 shows the locations and heights of buildings surrounding the shelter. An eighteen-story building (see Fig. 6a) lies directly opposite the shelter and approximately 110 feet away on the north side of Polk Street.

Another large building, nine stories high, is located directly east of the shelter 190 feet away (see Fig. 6b). The nearest large buildings or obstructions south of the shelter are at least a clock away (see Figs. 6c and 6d). West of the shelter is the east wing of the Student Residence Hall which divides the west wall of the shelter (see Fig. 7) and a six-story dormitory which lies 160 feet from the west wall of the shelter. All other structures within half a block of the shelter are of height and location such that they would have little effect on the wind conditions at the shelter windows.

2.4 Radiation Protection

An analysis of the she ter's radiation protection factor was made by Mr. W. B. Cobb, Registered ALLOLT Shelter Analyst (see Appendix A). Half of each dormitory room (the half away from the window) has a protection factor of 42 and therefore qualifies as shelter space. The corridor, providing better protection, has a protection factor of 110. This made 2750 square feet of floor area available for occupancy.



LEGEND

- * WINDSCOPE AND WIND SPEED TRANSMITTER LOCATION ON ROOF
- SHELTER TEST SITE

St.

8

Ó

(1)

3

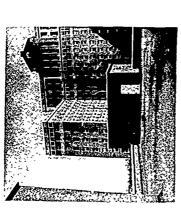
3

SE SE

S. S. S.

SURROUNDING BUILDINGS - Number Indicates Height in Stories

Figure 5 PLOT OF BUILDINGS SURROUNDING SHELTER







(b) East View



VIEW FROM ROOF OF STUDENT RESIDENCE HALL



Southeast View (၁



(d) Southwest View

Figure 6

ŝ

(; (;

Ĵ

6

ķ

Con con

Ė

Figure 7 EXTERIOR VIEW OF NORTHWEST CORNER OF STUDENT RESIDENCE HALL

SECTION 3

INSTRUMENTATION

3.1 Temperature Measurement

Shelter and ambient dry-bulb and wet-bulb temperatures were measured with nine aspirating psychrometers (Sargent Model S-42610), five of which were equipped with resistance type thermometers (Minco #1119) and the remaining four equipped with mercury-bulb glass thermometers. Three of each type were located within the shelter four feet above the floor (see Fig. 8), and the remaining three psychrometers were positioned outside windows of rooms 504 and 510 to measure ambient weather conditions (see Fig. 2). All resistance bulb readings were recorded continuously on a Honeywell strip-chart multi-point recorder.

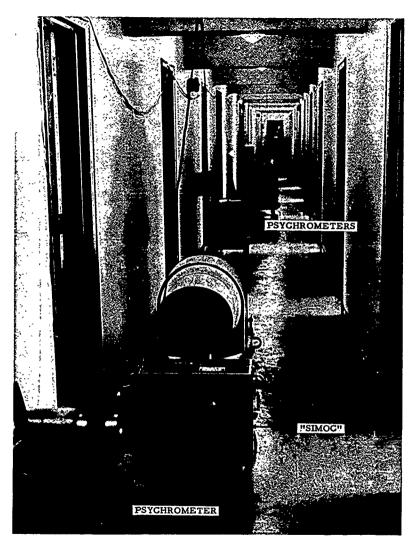
3.2 Shelter Energy and Moisture Inputs

Aggregate Simocs* (Ref. 1) were used to simulate the sensible and latent metabolic output of shelter occupants. Four Simocs were located along the corridor (Figs. 2 and 9) and adjusted to simulate uniform shelter loading of either 100 occupants or 185[†] occupants.

The total occupant energy input to the shelter was measured each hour with a kilowatt-hour meter (Sangamo Model #P3ODS, Class 200). This power input was adjusted, as required by line voltage variation, to maintain 400 Btu per occupant-hour.

^{*}Simulated Occupants

⁺Maximum number of occupants that could be simulated due to limited electrical power.



B

E

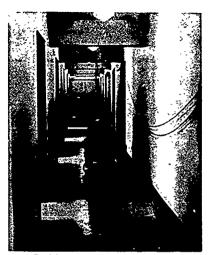
3

3.2

ŝ

Ê

Figure 8 INTERIOR VIEW OF SHELTER CORRIDOR LOOKING FROM SOUTH TO NORTH



Looking South Prom Center of Corridor



Looking North From Center of Corridor

Figure 9 OTHER INTERIOR VIEWS OF SHELTER CORRIDOR

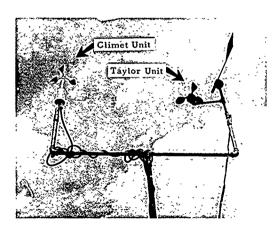


Figure 10 WIND INSTRUMENTS

During the entire test the shelter lighting and instrumentation loads were constant at 4780 Btu per hour.

The rate at which water (latent energy input) was discharged by the Simocs was measured hourly on a balance-beam platform scale. This rate was compared to the computed rate for 100 or 185 occupants, and the Simocs were adjusted as necessary to maintain the desired rate.

3.3 Wind Speed and Direction

É

P

Wind instruments (see Fig. 10) were placed on the penthouse roof which is about 95 feet above ground level. The instrument stand extended another 20 feet into the air which enabled readings of wind speed and direction to be measured at an elevation of 115 feet above ground level.

A Taylor Windscope (Model 3105) and a Climet Wind Speed Transmitter (Model Oll-1) were placed atop the instrument stand. The Taylor Windscope gives instantaneous readings of wind speed and direction on a meter. The Climet Wind Speed Transmitter records an integrated time average wind speed on a digital counter.

SECTION 4

PROCEDURES

The eight tests that were conducted evaluated the effects of natural ventilation. These tests are summarized in Table 1.

4.1 Data Recording

The shelter and ambient air dry-bulb and wet-bulb temperatures and water input to the Simocs were logged hourly. The total Simoc power was also recorded each hour from the kilowatt meter. Every hour the average wind speed and direction were recorded during a one minute observation; in addition, an hourly integrated value of the wind speed was recorded with the Climet Wind Speed Transmitter.

From the U.S. Weather Bureau at Midway Airport, 7.6 miles southwest of the shelter, hourly conditions of the wind speed and direction were obtained and compared to the observations at the shelter site.

Psychrometric air properties were determined from the shelter average dry and wet-bulb temperatures using the ASHRAE Psychrometric Chart No. 1 (Ref. 2). Effective temperatures and humidity ratios were determined from tables developed by GARD (see Appendix B).

4.2 Determination of Ventilation Rate

The natural ventilation rate was calculated by the steady-state tracer gas technique using water vapor as the tracer gas (Ref. 3). The increase in shelter humidity ratio over ambient humidity ratio is related to the average

€3				[Γ			<u> </u>	he		<u> </u>			
				:			open 21, 5 inches open 21, 5 inches			open 21, 5 inches, 5 inches, and & 528) open 21, 5 inc	k 535) open 21, 5 inch- open 21, 5 inches, and , 524, 527, & 529) open 21, 5 inches	One window in each of twenty-one rooms open 21, 5 inches			
D				ENINGS **			531 4 532)			531 & 534) 6) open 21. .521, 524,	531, 533, 4 515 4, 517) 520, 522,	-one room			
				Ventilation openings **	pen 3 inchei	All 41 windows open 6 inches	4 windows on NW wall (rms. 531 & 532) open 21, 5 inches 4 windows on SE wall (rms. 519 & 520) open 21, 5 inches	All 41 windows open 3 inches	All 41 windows open 6 inches	2 windows on NW wall (rms, 531 & 534) open 21, 5 inches, I window on SW wall (rm, 516) open 21, 5 inches, and 3 windows on East wall (rms, 521, 524, & 528) open 21, 5 inches	3 windows on NW wall (rms, 531, 533, & 535) open 21.5 inches, 2 windows on SW wall (rms, 515 & 517) open 21.5 inches, and 5 windows on East wall (rms, 520, 522, 524, 527, & 529) open 21.5 inches	h of twenty			
Cia				VENTIL	All 41 windows open 3 inches							ndow in eac			
1. 2.		rol .										One wit			
	н	Summary of Shelter Tests	ter Tests	ter Tests		"OCCUPIED" SHELTER AREA	Corridor	=	=	Corridor and approximately half the area of each room		ŧ	:	:	
Ñ	Table 1	of Shel			o	٥			•		<u> </u>				
		mary c		NUMBER OF OCCUPANTS	100	100	100	185	185	185	185	185			
3				TEST DURATION (HOURS)	48	24	80	\$0	48	48	21	16	which		
SE SE				ATE(S)	2 to 7/14	4 to 7/15	7 to 7/19	12/L ot 6	1 to 7/23	5 to 7/27	זנוו	7 to 7/28	Dimension given is the height to which bottom sash is raised above sill the bottom sash is raised above sill bottom.		
8			-	ů G	7/1:	1/1	7/1	1/1	7/2	1/2:	_	1/2	given is h is rais		
25.55 25.55				LOGSHEET NUMBER (S)	1,2	3	4,5,6	6,7,8	9,10	11, 12	13	14	• Dimension bottom sale		
8				ST 4BER 1	_	2	3	•	٠,	٠	2		•		
E C				TE						-					
				G	ENEF	RAL	AMI	ERICAN	RES	BEARC	H DIVIS	ION			
E-3				_					15						
4342+124 4342	NO.	\ (\)\{\(\)	neroceanananan		249W			enerana Paranana	rJ.	NIVIN	ያለኛ <u>የ</u> ጀት የ	Y	#\$\$\$\$\$#\$#\$\$\$\$\$\$\$#################		

shelter ventilation rate in accordance with the following equation:

$$Q = \frac{(v_o)(M_w)}{60(M_s - W_o)}$$
 (1)

where:

Q = ventilation rate, cfm

 $v_{o} = \text{specific volume of ambient air, } ft^{3}/\text{lb d.a.}$

 $M_w = \text{mass of water vapor supplied to shelter by Simocs, } 1b_w/hr$

 $W_{c} = \text{humidity ratio of shelter air, } lb_{w}/lb d.a.$

 W_{0} = humidity ratio of ambient air, lb_{W}/lb d.a.

Equation 1 assumes:

- 1. construction materials impervious to water vapor,
- 2. no water vapor diffusion through open windows,
- no moisture storage or release from the volume of the shelter air, and
- 4. no condensation of liquid water within the shelter.

The error introduced by the first and second assumptions is small when using the steady-state technique. The third assumption could introduce a considerable error when considered on an hourly basis; however, over a period of several hours or more, this error becomes insignificant. The fourth assumption was valid for the entire testing period.

SECTION 5

TEST RESULTS AND DISCUSSION

Natural ventilation moves air through buildings without the help of mechanical equipment. The forces of wind pressure and density (thermal) differences provide the necessary motive forces to move air through ventilation openings and into and through buildings.

Thermal forces are produced when sensible heat and water vapor are added to a volume of air causing it to become less dense, rise and displace denser air. In tall buildings where stairwells, elevator shafts and other ventilation openings provide paths for vertical movement of air, ventilation rates due to thermal forces can be significant. In this test, however, all stairwells and elevator shafts were closed to prevent any air movement due to thermal forces (see Section 2.2).

Since thermally motivated forces were excluded during the testing period, it was expected that the air forced through the shelter was due to wind effects alone. The quantity of air forced through a window or ventilation opening may be predicted by the equation (Ref. 4):

$$Q_{w} = EAV$$
 (2)

where:

ĵ

8

Ñ

Q = air flow, cubic feet per minute

A = free area of inlets or outlets (assumed equal), square feet

V = wind velocity, feet per minute

E = effectiveness of openings (suggested values range from 0.25 to 0.60 depending upon the direction of the wind on the shelter) Corrections are presented in the ASHRAE Guide and Data Book for the effect of unequal inlet and outlet areas. This correction (F), expressed as a multiplier of (EAV) and which is always ≥ 1.0 , represents the increase in air flow above that which results for equal inlet and outlet areas (F = 1.0).

The prime objective of the data analysis is to establish a window effectiveness factor (E) for a corridor-type shelter. At first glance it might appear
that E is a function of only the angle at which the air approaches the opening,
and for the most part this is true; however, other influences such as the type
of ventilation opening, the internal configuration of the shelter, the exterior
shelter surroundings and the density of occupancy loading can all have an
effect on the value of E. To separate these effects is a complex task.

To empirically determine the opening effectiveness, E in equation 2, the data was grouped according to wind direction. These data groupings were then plotted as ventilation rate per square foot of window area versus wind velocity. With the inclusion of appropriate constants, the slope of the least-squares curve fit to the data then represents the window effectiveness factor E.

5.1 Directionally Dependent E-Factor

Previous investigations (Refs. 5 to 8) have indicated that the window effectiveness factor is a function of the angle at which air approaches a ventilation opening. To further evaluate this effect the data was grouped into 16 wind direction intervals. These intervals included the 45° over-

lapping wind sectors of

NNW-N-NNE NNE-NE-ENE ENE-E-ESE ESE-SE-SSE SSE-S-SSW SSW-SW-WSW WSW-W-WNW WNW-NW-NNW

and the 90° overlapping wind sectors of

NW-N-NE N-NE-E NE-E-SE E-SE-S SE-S-SW S-SW-W SW-W-NW W-NW-N

The data points included in each of these sixteen wind direction intervals were then fit with a linear least squares curve (linear because equation 2 indicates that Q should be a linear function of V). Figs. 11 to 18 depict the least squares curve fit for the 90° sectors and present the effectiveness factor which was determined by the slope of the curve.

Table 2 summarizes numerically the results for the sixteen intervals for an assumed equal inlet-outlet window pattern (F = 1.0) and for various limits of experimental error as determined in Section 5.4. As the value of $\left[W_S-W_O\right]$ is decreased, the maximum possible experimental error increases. Hence, the results listed in Table 2 for $\left[W_S-W_O\right] \ge 0.00200$ have the least possible experimental error.

Based upon the data collected during the limited testing period, it appears that the 90° wind sector results give a truer indication of the E-factor than the results for the 45° wind sectors. This conclusion is based upon two observations: first, the range of E for the 90° sectors is in closer agreement with the physical conditions which actually surround the shelter and second, too few data points are available for certain sectors of the 45°

analysis to put much faith in their results. Subsequent analysis is therefore based upon the values of E obtained with the 90° wind sector analysis for $\left[W_S-W_O\right] \geq 0.00200$.

Table 3 summarizes the same data groupings as were used in Table 2, using, however, the actual inlit-outlet window pattern which existed during the test as determined by hourly observations. Comparison of the two tables show that the experimental values of E remain almost the same for the results with $\begin{bmatrix} w_s - w_o \end{bmatrix} \geq 0.00200.$ This indicates that the open window area was split evenly between inlets and outlets during most of the testing period.

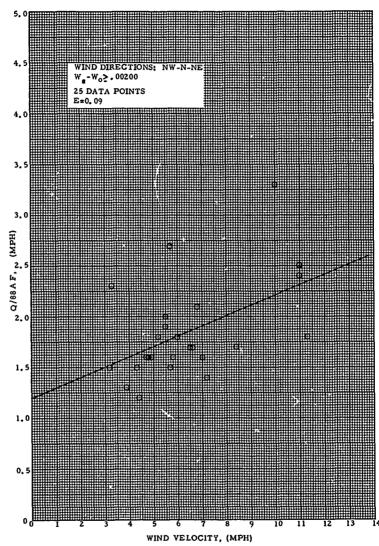
5.2 Overall E-Factor

During any designated time period (whether it be for a day, week, month or year), the wind direction does not remain constant, therefore, the calculation of average ventilation rates based upon the directional E-factors would have little value. An overall or average E which is independent of wind direction would have more applicability.

An overall E-factor of 0.15 was calculated for this shelter with a least squares analysis similar to that discussed previously. The overall E was determined by a least squares fit of all data points from all wind directions with a value of $\begin{bmatrix} W_S - W_O \end{bmatrix} \ge 0.00200$ (see Fig. 19).

5.3 Comparison of Local and Weather Bureau Data

Local wind speed and direction data were obtained from the U.S. Weather Bureau located at Midway Airport which is 7.6 miles southwest of the shelter. In addition, observations of wind speed and direction were made at the shelter



j

B

ì

<u>S</u>

8

E

3

C

Figure 11 CORRELATION OF DATA FOR NW-N-NE WIND SECTOR

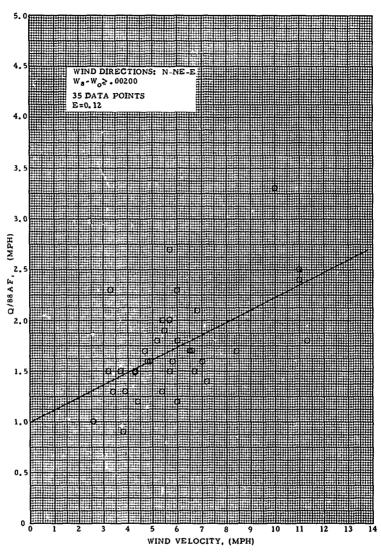
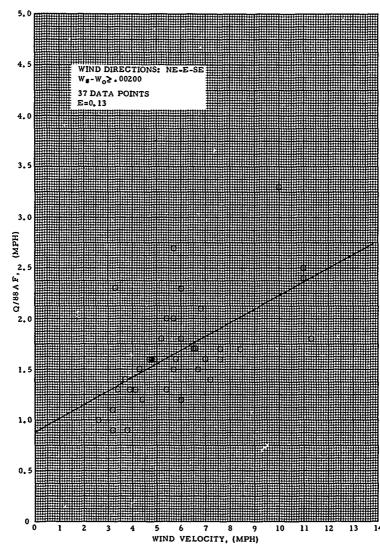


Figure 12 CORRELATION OF DATA FOR N-NE-D WIND SECTOR



8

8

Ì

23

5

8

Ü

223

C &

63

3

S

e

Figure 13 CORRELATION OF DATA FOR NE-E-SE WIND SECTOR

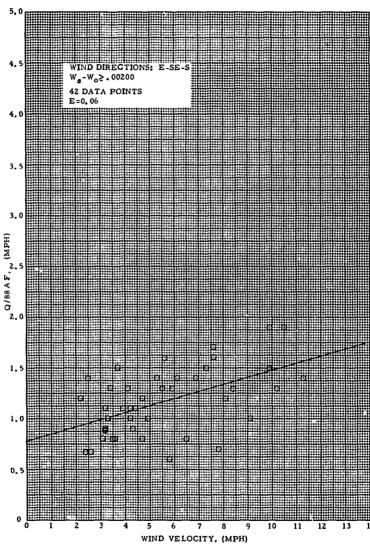
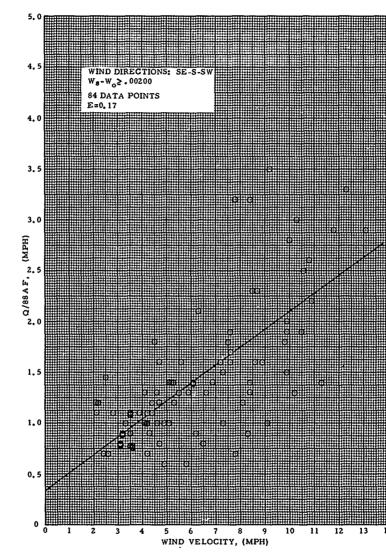


Figure 14 CORRELATION OF DATA FOR E-SE-S WIND SECTOR



S

Ñ

8

3

ŝ

Î

(°

3

3

3

100

Figure 15 CORRELATION OF DATA FOR SE-E-SW WIND SECTOR

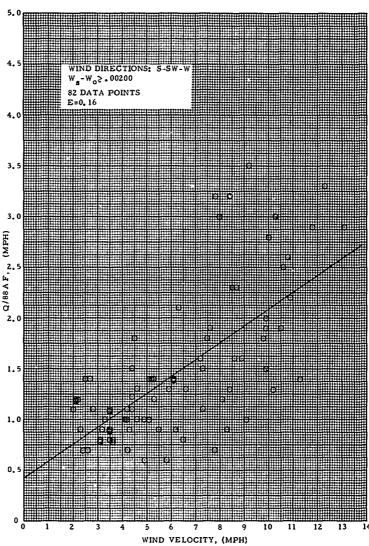
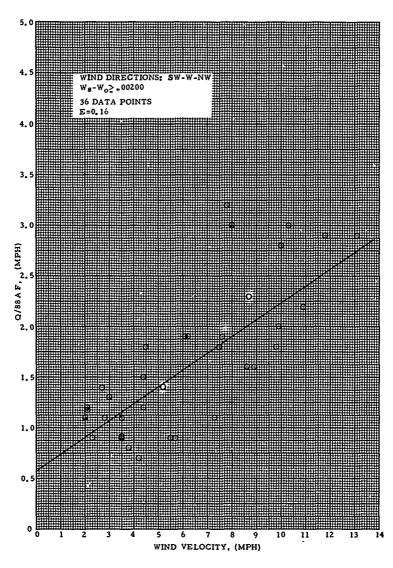


Figure 16 CORRELATION OF DATA FOR S-SW-W WIND SECTOR



3

()

1

S

Figure 17 CORRELATION OF DATA FOR SW-W-NW WIND SECTOR

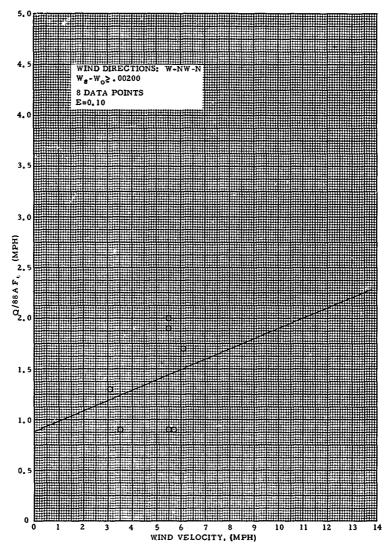
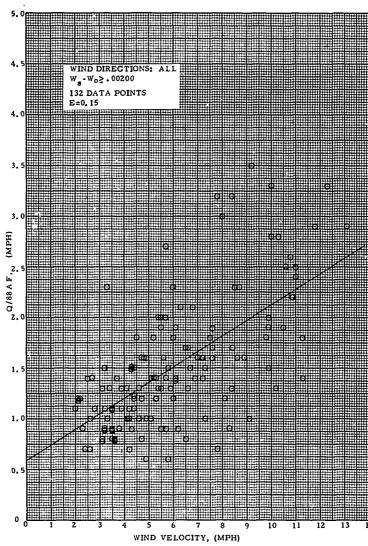


Figure 18 CORRELATION OF DATA FOR W-NW-N WIND SECTOR



E

(j

(X:

į,

心

医路

Figure 19 CORRELATION OF DATA FOR ALL WIND SECTORS

Table 2 DIRECTION DEPENDENCE OF E-FACTOR (for F = 1.0)

		Humidit	y Difference - 1b / 1b	d.a. [Ws-Wo]
Wind Directions ALL		≥ .00200	≥ .00150	> .00100 ·
		0.15 (132)	0.15 (164)	0.24 (225)
NNW-N-NNE NNE-NE-ENE ENE-E-ESE ESE-SE-SSE SSE-S-SSW SSW-SW-WSW	Wind Sectors	0.21 (4) 0.12 (32) 0.19 (12) 0.13 (11) 0.16 (55) 0.20 (50)	0.24 (6) 0.17 (49) 0.32 (17) 0.15 (12) 0.15 (59) 0.21 (55)	0.33 (17) 0.22 (73) 0.49 (23) 0.15 (12) 0.16 (66) 0.21 (69)
wsw-w-wnw wnw-wn-wnw	<u>,</u> 54	0.12 (11) 0.10 (4	0.12 (15) -0.03 ⁻ (7)	0.15 (24) 0.13 (15)
NW-N-NE N-NE-E NE-E-SE E-SE-S SE-S-SW S-SW-W SW-W-NW	90° Wind Sectors	0.09 (25) 0.12 (35) 0.13 (37) 0.06 (42) 0.17 (84) 0.16 (82) 0.16 (36) 0.10 (8)	0.15 (41) 0.18 (54) 0.18 (55) 0.07 (46) 0.18 (91) 0.17 (91) 0.17 (44) 0.16 (14)	0.21 (73) 0.27 (89) 0.25 (79) 0.20 (53) 0.18 (105) 0.17 (109) 0.16 (63) 0.27 (30)

NOTES: Number of hourly data points for each correlation are given in parenthesis.

Results are for all tests, day and night hours, and for all wind velocities.

(A)

ij

3

_											
Wind		Humidity Difference - lb _w /lb _{d.a.} (W _s -W _o)									
Directions		≥ .00200	≥ .00100								
ALL		0.15 (132)	0.21 (164)	0.26 (225)							
NNW-N-NNE		0.18 (4)	0.34 (6)	0.40 (17)							
nne-ne-ene	rs Si	0.11 (32)	0.29 (49)	0.26 (73)							
ENE-E-ESE	Sectors	0.23 (12)	0.44 (17)	0.60 (23)							
ESE-SE-SSE		0.09 (11)	0.11 (12)	0.11 (12)							
SSE-S-SSW	Wind	0.18 (55)	0.17 (59)	0.18 (66)							
SSW-SW-WSW		0.25 (50)	0.26 (55)	0.25 (69)							
wsw-w-wnw	145°	0.12 (11)	0.12 (15)	0.19 (24)							
WMN-WW-NWW		-0.07 (4)	-0.13 (7)	0.13 (15)							
NW-N-NE		0.09 (25)	0.25 (41)	0.24 (73)							
n-ne-e		0.12 (35)	0.30 (54)	0.33 (89)							
ne-e-se	Sectors	0.11 (37)	0.29 (55)	0.31 (79)							
E-SE-S	ect	-0.01 (42)	0.00 (46)	0.16 (53)							
SE-S-SW		0.17 (84)	0.17 (91)	0.18 (105)							
S-SW-W	Wind	0.16 (82)	0.17 (91)	0.17 (109)							
SW-W-NNW	90°	0.15 (36)	0.16 (44)	0.16 (63)							
W-NW-N	5	0.11 (8)	0.16 (14)	0.28 (30)							

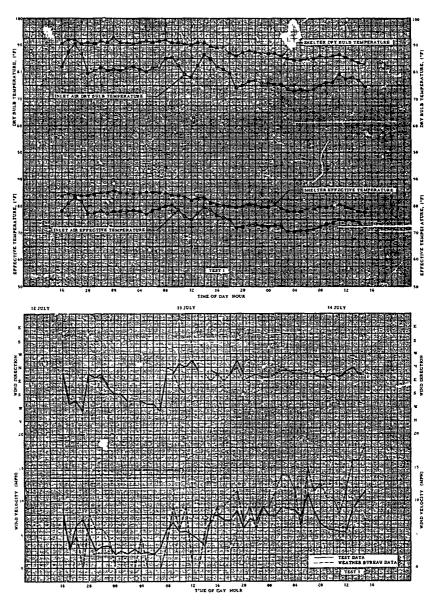
NOTES: Number of hourly data points for each correlation are given in parenthesis.

Results are for all tests, day and night hours, and for all wind velocities.

and compared to the Weather Bureau observations. The temperature and wind conditions, which existed during the testing period are presented in Figs. 20 to 26.

Good correlation between Weather Bureau and shelter observed wind direction were obtained even when the local wind <u>direction</u> was such that the shelter was shielded by adjacent buildings. Wind <u>speed</u> observations compared favorably except when the wind was out of the north or northeast where the shelter was shielded. For these directions, the Weather Bureau readings were approximately 5 mph greater than those observed at the shelter.

During the twelve day testing period, the average wind speed recorded at the shelter was 7.4 mph; the average wind speed as recorded at the Weather Bureau for the same period was 9.7 mph. The difference in agreement is probably due to the shielding effects which existed during certain wind periods and also due to the manner in which the two readings were recorded. The Weather Bureau's determination is an instantaneous reading taken once every hour on the hour for a one minute interval. The shelter observation is an interval or average determination which was recorded over the entire hour by the Wind Speed Transmitter. The shelter observation would give a truer indication of the average wind speed. Difference in readings may also be due to the Weather Bureau observations being made at a point 20 feet above-grade while the shelter observations were made 95 feet above-grade.



10

Ş

Figure 20 TEST 1 TEMPERATURES AND WIND CONDITIONS
GENERAL AMERICAN RESEARCH DIVISION

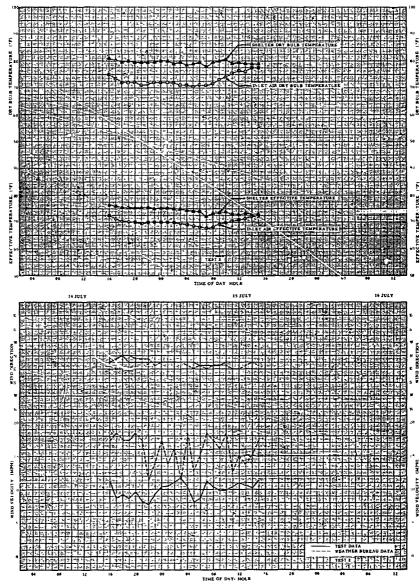
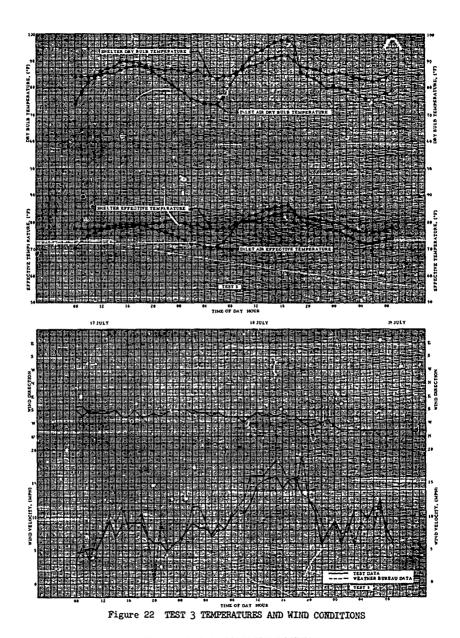


Figure 21 TEST 2 TEMPERATURES AND WIND CONDITIONS

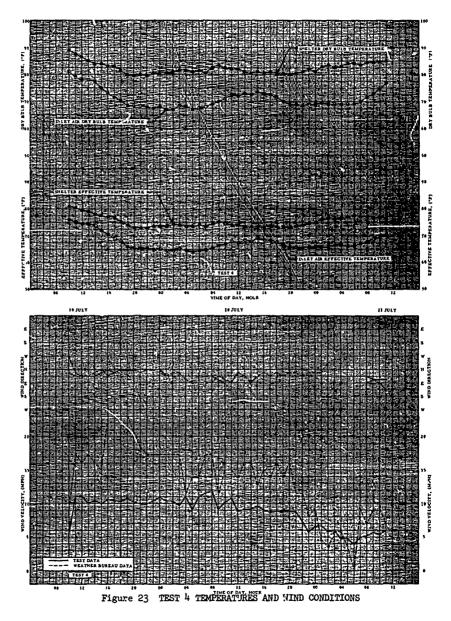


2

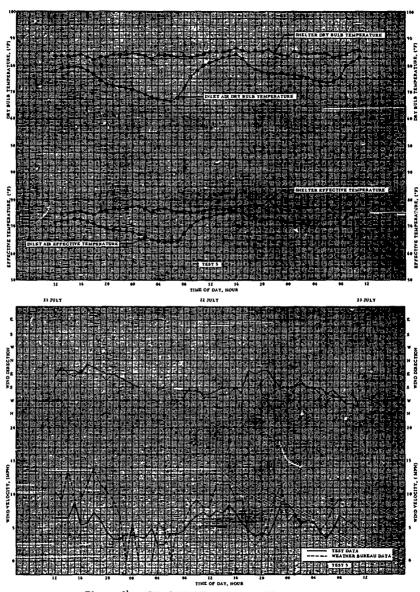
T.

Ž

GENERAL AMERICAN RESEARCH DIVIBION



GENERAL AMERICAN RESEARCH DIVISION



8

Figure 24 TEST 5 TEMPERATURES AND WIND CONDITIONS

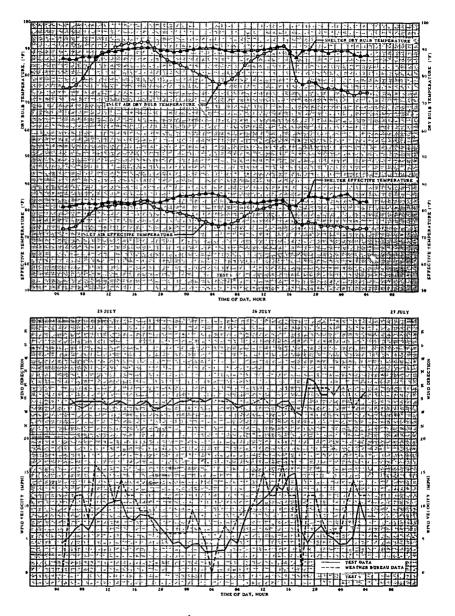
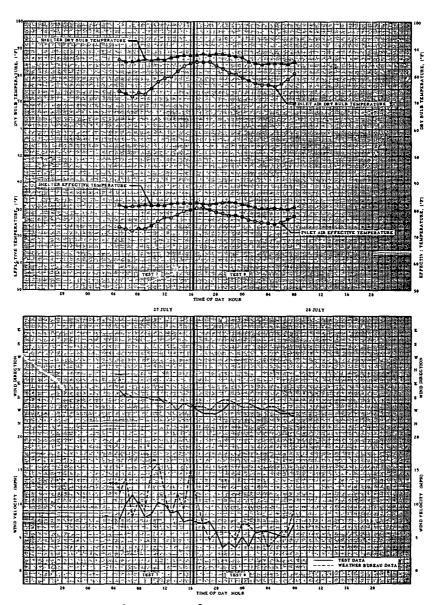


Figure 25 TEST 6 TEMPERATURES AND WIND CONDITIONS



3

Figure 26 TESTS 7 AND 8 TEMPERATURES AND WIND CONDITIONS

5.4 Error Analysis

The following analysis is made in order to evaluate the accuracy of the indicated ventilation rate as measured by equation 1.

Given a function of n number of variables, the relative error in P, $\frac{d(P)}{P},$ is defined as

$$\frac{d(b)}{d(b)} = \frac{1}{2} \left[\left(\frac{Qx^1}{Qb} \right) \cdot q(x^1) + \left(\frac{Qx^2}{Qb} \right) \cdot q(x^2) + \dots + \left(\frac{Qx^n}{Qb} \right) \cdot q(x^n) \right]$$
(3)

where:

d(P) = absolute error in the property, P

 $d(X_1)$ = absolute error in the variable, X_1 , due to experimental measurement

 $\frac{\partial P}{\partial X_1}$ = absolute error contribution to the property, P, due to the variable, X_1 , with all other variables held fixed.

Using this method, an estimation of the relative error in the measured air flow is made in this section.

Applying the above discussion to equation 1, the relative error in the measured ventilation rate is:

$$\frac{d(Q)}{Q} = \begin{bmatrix} \frac{d(M_w)}{M_w} \end{bmatrix} + \begin{bmatrix} \frac{d(v_o)}{v_o} \end{bmatrix} - \begin{bmatrix} \frac{d(W_s - W_o)}{(W_s - W_o)} \end{bmatrix}$$

$$(4)$$

The water input to the shelter was measured to the nearest half-pound, thus $d(M_W) \leq \pm 0.25$. The specific volume, v_o , can be read from the psychrometric chart within 0.1 cubic feet per pound of dry air, so $d(v_o) \leq \pm 0.05$. Drybulb and wet-bulb temperatures were read to the nearest half-degree giving a corresponding inaccuracy to the humidity ratio of $d(W_S - W_o) \leq \pm 0.0005$ (from the psychrometric chart).

Therefore.

$$\frac{d(Q)}{Q} = \left[\frac{\pm 0.25}{M_W}\right] + \left[\frac{\pm 0.05}{v_o}\right] - \left[\frac{\pm 0.0005}{W_s - W_o}\right]$$
(5)

Throughout the test these relationships held.

$$M_{\rm w} \ge 12.0$$
 lbs/hr

$$v_0 \ge 13.0 \text{ ft}^3/16$$

Therefore, considering the relative magnitudes of the terms in equation 5, the relative error can be approximated as

$$\frac{d(Q)}{Q} \le \frac{0.0005}{W_0 - W_0}$$

and for periods when

$$[W_s - W_o] \ge 0.0020,$$

we have

$$\frac{d(Q)}{Q} < 0.25$$

or the maximum possible error due to measurement in the measured air flow rate is less than 25 percent. Table 4 summarizes the measurement error for various humidity ratio differences and indicates the corresponding number of hourly data points that are available for analysis.

Table 4 Measurement Error

[Ws-Wo]	Max. Possible Erro.	No. of Data Points
≥ 0.00100	< 50.0%	225
≥ 0.00150	< 33.3%	164
≥ 0.00200	< 25.0%	132

NOTE: As W -W decreases, you are in effect including points which have higher ventilation rates.

5.5 Adequacy of Natural Ventilation

With the aid of results from a companion study (Ref. 9) conducted at GARD it is possible to establish adequacy limits for a shelter located in Chicago and ventilated by natural ventilation only. The results of the study are presented in the form of adequacy curves which were generated based upon ten years of hourly Weather Bureau recordings of wind condition and wet and dry-bulb temperatures. Once the EA value for a particular shelter is known, the adequacy curve can be entered and for a desired maximum shelter effective temperature the adequacy of natural ventilation determined.

For the Chicago shelter, an overall window effectiveness factor of 0.15 was calculated. Assuming that the maximum open window area is obtained when the bottom sash of each window is raised to its extreme, the total area available for inlet air, assuming equal inlets and outlets, is 119 square feet. Using all available floor area that has a radiation protection factor of greater than 40 (see Section 2.4), the maximum occupancy level at 10 square feet per person is 275 occupants. The EA value of the shelter can then be established as:

EA = $\frac{0.15 \times 119}{275}$ = 0.065 square feet per occupant

Entering the abscissa of Fig. 27 at a value of EA = 0.065 square feet per occupant and for a limiting shelter ET of 83°F, the adequacy of natural ventilation for this shelter is 0.982. This means that 98.2% of the time, or for all but seven of the days during the year natural ventilation will adequately ventilate the shelter such that the ET will not rise above 83°F with 275 occupants within the shelter.

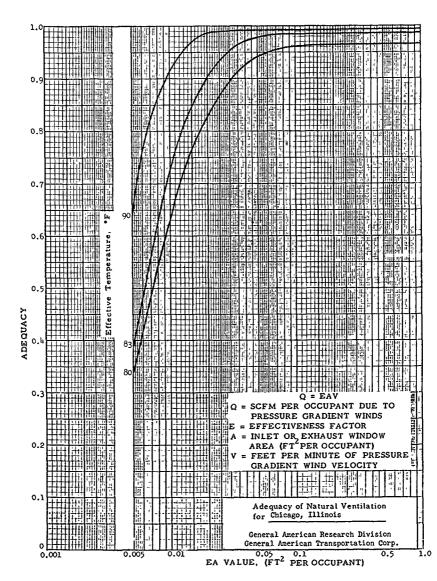


Fig. e 27 NATURAL VENTILATION ADEQUACY CURVE FOR CHICAGO, ILLINOIS

If the occupancy density is lowered to 8 square feet per occupant, 344 occupants will be able to be housed within the shelter and the resultant value of EA is 0.052 square feet per occupant. The adequacy for the same limiting shelter ET of 83°F is then reduced to 98.0%. This change is negligible.

If the lowest E recorded in Table 2 for the 90° wind sector analysis was used instead of the overall E, the resulting change in adequacy is less than one percent. The overall E can therefore be used as a design value for a corridor-type shelter located in Chicago.

5.6 Comparison of Ventilation Rates

A simplified equation for estimating natural ventilation due to wind forces for aboveground structures has been proposed by Dr. Richard Condit of Stanford Research Institute (Ref. 10). His work is based upon building codes for various sections of the country, and upon design values of wind speeds which are set forth in the 1963 ASHRAE Guide and Data Book. The following equation resulted:

cfm/man = (floor area in sq. ft./man) x (wind speed in mph) (6)

For the wind speed Dr. Condit suggests that the adjusted ASHRAE hot weather design values (Ref.11) of H (high) = 5.5 mph, M (medium) = 3.5 mph, and L (low) = 2.0 mph be used. For Chicago the design value wind speed is M or 3.5 mph. Using 10 square feet of floor area per man, Dr. Condit's equation predicts 35 cfm/man which gives a ventilation adequacy of 97.7%.

The expected ventilation rate for this shelter can be calculated using the equation Q = EAV and the experimental values for effectiveness factor (0.15) and average wind speed (7.4 mph) obtained from these tests. If we

assume that one-half of the openable window area of the shelter acts as an air inlet, then F, the unequal inlet-outlet area factor, equals 1.0, and A=119 square feet. It follows that the ventilation rate per shelteree is

$$Q = 88(1.0)(0.15)(119)(7.4)/275 = 42.3 \text{ cfm/man}$$

LI LI

3

6

Therefore, Condit's formula predicts a ventilation rate about 20% less than the rate derived from the average experimental results. With this particular shelter, Condit's method appears to be useful for predicting general expected ventilation rates.

SECTION 6

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are made based on the test data:

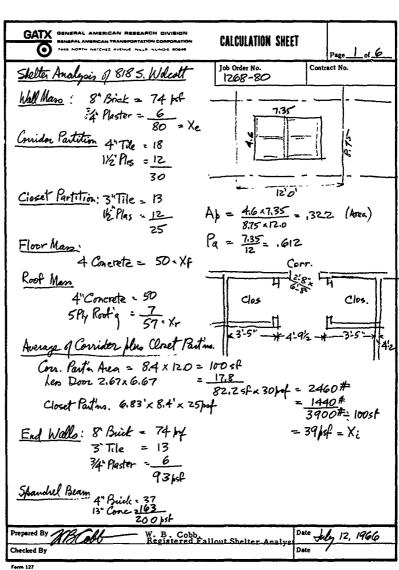
- An overall window effectiveness factor of 0.15 was obtained from the correlation between wind speed and ventilation rate. This window effectiveness factor is independent of wind direction.
- 2. The shelter will be adequately ventilated 98.2% of the days during the year. This estimate is based upon a compilation of ten years of Weather Bureau data and a calculated EA value of 0.065 sq ft/occ for the shelter.
- Half the windows functioned as inlets and half as outlets based upon ASHRAE E-factor analysis.
- 4. In general, the highest winds occurred during the warmest period of the day (1200-1600 hours), and some air movement was observed at all times with the hourly averaged wind velocity never being lower than 2.0 mph.
- 5. Future natural ventilation work should center around three objectives:
 - a. Run modeling studies using a low speed wind tunnel to test scale models of actual buildings already tested and then formulate a law to predict natural ventilation.
 - b. Determine adequacy curves for natural ventilation of building located in other cities than Chicago using existing weather data.

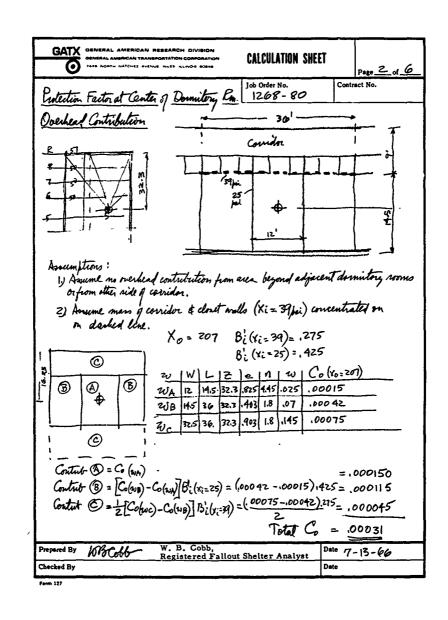
REFERENCES

- Behls, H. F., et. al., "Operation and Maintenance Manual For OCD Shelter Test Equipment", Volumes I and II, GATC Report MRD 1191-2, Contract No. OCD-OS-62-99, DDC No. 446238 and 446237, Niles, Illinois, December 1963.
- ASHRAE Guide and Data Book, 1965 Edition, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., New York, New York.
- "Measurement of Natural Draft", The College of Engineering, The Pennsylvania State University, Contract No. OCD-OD-62-64, University Park, Pennsylvania, December 1963, p. 35.
- 4. ASHRAE, op. cit., eqn. 5, p. 465.
- Madson, C. A., et. al., "Natural Ventilation Test of an Aboveground Fallout Shelter in Bozeman, Montana", GATC Interim Report, MRD 1195-56-2, Contract No. OCD-OS-62-134, DDC No. 453070, Niles, Illinois, November 1964.
- Madson, C. A., et. al., "Natural Ventilation Test of an Aboveground Fallout Shelter in Baton Rouge, Louisiana", GATC Interim Report, MRD 1268-20, Contract Nc. B-64220(4949A-16)-US, DDC No. 456893, Niles, Illinois, January 1965.
- Meier, H. A., et. al., "Natural Ventilation Test of an Aboveground Fallout Shelter in Evanston, Illinois", GATC Interim Report, GARD 1268-51, Contract No. B-64220(4949A-16)-US, Niles, Illinois, January 1966.
- 8. Henninger, R. H., et. al., "Natural Ventilation Test of a Basement Fallout Shelter in East Chicago, Indiana", GATC Interim Report, GARD 1266-61, Contract No. B-64220(4949A-16)-US, Niles, Illinois, January 1966.
- Baschiere, R. J., et. al., "Summary Report On The Reliability of Natural Ventilation and Evaporative Cooling In Shelters", GATE Report 1266-1, Contract No. B-60421(4949A-4)-US, Niles, Illinois, November 1966.
- Personal Communication with Dr. R. I. Condit of Stanford Research Institute, Menlo Park, California.
- ASHRAE, op. cit., Table I, p. 470.
- 12. ASHRAE, op. cit., Fig. 7, p. 107.

X 12 223 P. 3 Ď 55.53 183 S 3. Ĭ. 6

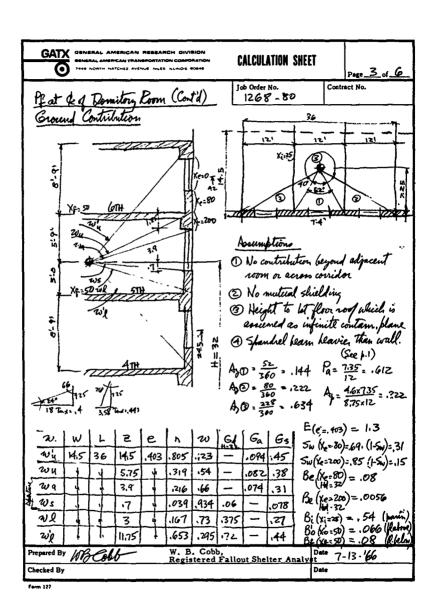
APPENDIX A PROTECTION FACTOR ANALYSIS FOR STUDENT RESIDENCE HALL





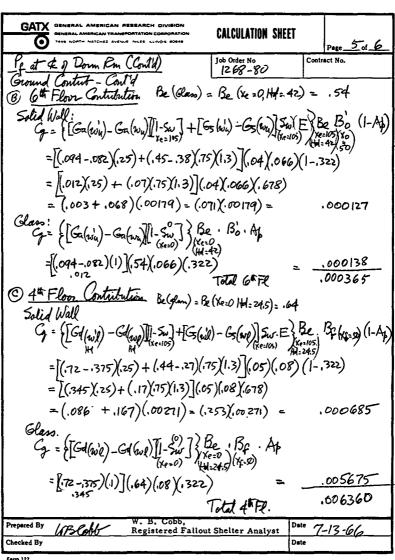
8

j



CALCULATION SHEET Contract No. Story a Detector (5th Flore) Be (fors) = Be (xe=0, Hd=321) = .59 1268-80 Stup of Wall above Windows: (Futition Bldz w/o Partin) (g = {[Ga(ey)...G(ex)]!.Sw) +[Gs(ex)...-Gs(ex)] Sw. E} Be(Ke=2ND) = = [(.082-.074)(.15)+(.38-.31)(.85)(1.3)].0056 (,0012 + ,0772),0056 .000438 Solid Wall except about windows: Cg = { [G(hw, H) - Pa.G(ws, Hd) + (1-Pa)(Ga(ku))][1-Sw(xe-80)] + [(1-Pa) Gs(uk) + Gs(uy) - Pa Gs(us)] Sw(Ke=80) E(e) Be (Ke=80) = { [375-(612x.06)+(388x.074)(3)+[(388x.31)+,27-(.612x.078)],69(13),08 80. [(19.77.4.0 - 75.+ 21.) + (15.870. + 7360. - 375] (.367)(.31)+ (.3423)(91)].08=(.1137+.3113)(08)-(.425)(.08)= .034000 Glaso: Glaso: Galas, H)+Galas) [-Sul(10=0)] Be (Xe=0) (1H=32) = .612 [(.06+.074)(1)]. 59 = (.612)(.134)(.59) =. Total for Floor of Detector (5th) = .0828 For floors above & below, average out weight of wall: (12x1.85x200) + (12x6,9x80) = 1060 = 105/4 Sw(Ke=105)=,75 (1-5w)=.25 Be (xe=105 H= 42)=.04 Be (xe=105 H=245)=.05 (CONFLOW) Date 7-13-66 Registered Fallout Shelter Analyst

Form 127



CALCULATION SHEET Page 6 of 6 Pe at Down. Em & (Could) Contract No. Job Order No. 1268-80 Cornered Contribution - Recap. Detector Floor - 5th = .082800 Floor Abril 6 = .000365 Floor Below - 4 = .006360 Total = .0895/25 Hove assumes complete fictitions bldg of uniform perimeter. Now apply azimuth angle fraction Az 1 Contribution = 10895 x , 144 (63) = A (2) " = .0895 X,222 X 154 = .0107 A (2) ... Total Grand Contrib. = 102360 " Rog Contrib = .00031 Total Re .02391 Protection Factor = Re : 1239, = 42 at center of Domitory Room. In other words, approximately half of the dornitory room (the half away from the windows) qualifies as a fallout shelter. The corridor is obviously bitter, approximately Pr = 110 W. B. Cobb. Date 7-13-66 Registered Fallout Shelter An Checked By

P

23.73 APPENDIX B EQUATIONS FOR THE TABLES OF EFFECTIVE TEMPERATURES AND HUMIDITY RATIOS AS A FUNCTION OF WET AND 3 DRY-BULB TEMPERATURES

8

8

65

Ž

E.

The tables are based on these relationships:

ET =
$$\frac{107.5 \text{ (DB-WB)} + 62.3 \text{ WB}}{62.3 + \text{DB} - \text{WB}}$$

where:

ET. = Effective temperature, °F

DB = Dry-bulb temperature, °F

WB = Wet-bulb temperature, °F

This relationship is limited to low air velocities and is restricted to the temperature range of

45°F < DB < 110°F

30°F < WB ≤ 100°F

Effective temperatures from these tables have an error of less than 0.5°F as compared to those determined from the ASHRAE Effective Temperature Nomogram (Ref. 12).

To determine the humidity ratio, Dalton's rule and perfect gas mixture relations are applied:

$$W = 0.622 \left[\frac{P_W}{P - P_W} \right]$$

where:

W = Humidity ratio, lbs water/lb dry air

P = Partial pressure of water vapor

P = Barometric pressure (sea level assumed) (P_w and P in consistant units)

$$P_{W} = P_{S} - \left[\frac{(P - P_{S})(DB - WB)}{2831 - 1.43 WB} \right]$$

where:

8

100

1

C KE

$$P_s$$
 = Saturation pressure of water vapor at wet-bulb temperature WB $(P_w, P_s$ and P in consistant units)

Accuracy is 0.5% or better for all but the lowest humidity ratios.

₩ SS. 77 NETVOXECENT EXECUTATION OF THE PROPERTY INVESTIGATION OF THE PROPERTY OF THE P K K APPENDIX C TEST DATA LOGSHEETS 83 $\langle z \rangle$ Ŋ 記念 B Cl

8

			1	771	**
			нос		
I ITTALE OF TECHNI			100 To 600 Med And San 3300 Ann To 100 San	100 .00	Ā
MELTER ENERGY P			AN CO B CO CO CO CO CO CO CO TO I TO TO TO TO TO TO HE AND HE WE	MF M4	7.
DEPARA	METABOLIC + EQUIPMENT AND LIGHTING LOADS	MATTAKA	42-		**
ACTUAL	POASE METER BEADING	Kep	THE ME I OW! SO ! SOL! SOL! SHE SEES SILL STE ! SHE FET ASS OF EAST OF E OLD CHE OLD OFFE OF LAND SOL		14
	INPUT (FROM POWER METER)	MATUME	MI HE NO NO NO NO NE NO NE NO NO NO NO NO AND	, 45×41 %	*
WATER	GESINED INPUT	15.00	ים לה ותפט ועשת וע לוג ועלע ות כה לה שו פת וו ות בת לה שאא זה		
	ACTUAL DIPUT	13 40		115115	- 25
	EXTRALEY INPUT	BTW/LB	(40 ————————————————————————————————————		~
	NP01	MATURE	\$40 0.01 0.01 0.01 0.07 0.07 0.07 0.05 "10 "0.05 0.05 10 10 10 10 10 11 11 11 11 11 11		/
TOTAL BACKTER EN	ERGY INPUT	METUNG	WL MF 357 315 315 315 315 315 317 410 410 412 406 412 44 044 6 450 451 451 451 454 464 451	4.144	42
			1		
TEMPERATURES	PSYCHROMETERS DESIGNANCE BULBS) C: CORRIDOR NORTH DOT	١	DEME WEND HO HOMO WE WOME NO HENE HE WO HE HE NO HE HO DI		
	CT CONTINUE NORTH WAT	1:	THE BOD MOST AND BUILDING BUILDING BEEN AS AND HOSPING AND THE WAS THE STATE OF THE PROPERTY O	275 270	
	C) CORRIDOR SOUTH DBT	1 .	40 420 410 41441 5 410 410 415 415 415 415 415 410 410 410 410 410 415 415 415 415 415 415	4540	
	C4 CORPLINE SOUTH WBT	*	The we me me me be me we we we we we me me me me me me me be he me	MEME	-
	C) CORRIDOR CENTER DBT	1 7	LES OF THE BLETTE STATE DO DO DO DE TO THE THE THE THE THE THE THE THE STATE OF THE	43 0 42 0	
	CT AMBIENT DOT - NORTH WALL OF WEST WING	! :	10 00 6 40 00 44 80 825 825 820 820 100 100 105 105 105 105 105 105 105 10	140 20	
	CO AMBIENT WET NORTH WALL OF WEST WING	1 ;	145160 110 115 150 150 150 150 150 165 165 150 150 15 The 745 160 160 144 10 110	116716	-
	C+ AMBIENT DBT - DOUTH WALL OF WEST WING		US BIS WEST ON BUT OF BUT WE WE WE WE WE WE WE BE HE WE THE THE DIE	11640	
	CIPAMBIENT WET SOUTH WALL OF WEST WING		135 715 715 710 760 165 760 745 760 765 760 765 760 76 765 775 775 775 745 74 5 74 5 74 5 7	70 + 150	:
			t		
	PSYCHROMETERS (MERCORY BULB THERMOMETERS)	4	[· · · · · · · · · · · · · · · · · · ·		
	GI CORRIDOR NORTH DET		. To the	2,5,7	
	GI CORADOR NORTH WAT	1 ;	the MS tie wo we me to eight he had been to the me to the me to the me see the me to t	704 142	
	GS CORREGO - CENTER DET		100 420 410 HE 425 400 45 400 40 40 40 40 40 45 45 45 40 40 45 HE 400 HE HO 45	950 110	
	Of CONSIDOR CENTER ARE	,	The one are one we we we will see one the the we we we we we are	725 130	
	GA CORRIDOR SOUTH DRI GA CORRIDOR SOUTH WRT	1 5	the man man of the man and a transfer and the state of an are the state of the stat	415 40	
	G? AMBIENT DOT MORTH WALL OF WEST WING	1 ;	The two stands we recognize the stands of th	100 MM	
	GO AMBIERT WET HORTH WALL OF WEST WING	1 -	145.745.185.185.185.280.255.250.355.25 145.155.155 165 160 160 160 165 140 110 16 16	790 700	
		1	b		
AVERAGES					
AMBIENT	DRY BULB TEMPERATURE		Beart (45 11 1935) 15 16 16 16 16 16 16 16 16 16 16 16 16 16	NF 150	242
	WET BUIG TEMPERATURE	,	160 165 165 160 165 160 165 165 165 166 166 166 166 16 760, 16 760, 16 16 16 16 16 16 16 16 16 16 16 16 16	14 + 78 5	750
	EFFECTIVE TEMPERATURE SPECIFIC VOLUME		22 h. It. 117 Tte Th. NA TE 70 MI WE NO THE MO ME MO ME NO WI LE ME NO THE	45 77	787
	MUNIMITY RATIO	18,/LB4	the two mis are too its [13] [14] the confirm annual the the last and the property for the too	HIH	HU
			The same of the sa	****	
MIELTER	DRY BOLD TEMPERATURE] +	ne, the are die althoughes are the artificient are and althoughes are supposed and the extension of the best provided in the supposed and the supposed are are supposed and the supposed are are supposed as the supposed suppos	44 146	915
	RET BULB TEMPERATURE	, ,	THE BETTERS BY BETTERS BORETEREDED FOR SOME HE WE NO WOULD	115155	20.5
	EFFECTIVE TEMPERATURE SPECIFIC VOLUME	1*	BU 417 14 141 141 141 141 141 141 141 141	11 8 5-1	148
	SPECIFIC VOLVME	F1 ³ /LB ₄₄	the term to the term and the term the terminations and the free flowing the termination of the first flowing the flowing the first flowing the flowing the first flowing the f	4143	77.7

wind.		1			~
WEATKER	BUREAU WIND VELOCITY	MPK	69 35 44 00 11 51 58 46 00 44 40 00 HL CO AL CL 25 41 CO AL CL		35
	WIND DIRECTION	1	69 35 44 00 El 59 58 46 00 00 00 46 00 00 00 35 43 53 43 00 00		43
		1.			
#00F	COUNTER READING, R WINE VELOCITY (N 5 + 6 75 + R)	I OUNTS	0 PM 0 2M, 0 MS 0 MS 0 MS 0 2M 0 25 0 3M 0 M 1 0 25 2 0 M 0 M 0 0 M 0 MM 0 170 0 M0 0 M 0 M 0 SM 0 SM 0 MM 0 MM	emies?	0 +3
	AND DIRECTION	MPR	100 A7 65 75 71 A6 35 35 25 25 31 32 31 A5 A6 81 57 57 57 57 57 69 65	17 60	.10
	WIND VELOCITY (TAYLOR WINDSCOPE)	MPH			
		1	And the state was a series of the state and the state and the state and the state and the state as the state and t		
AIR FLOW BATE		CFM		_	
AIR PLOW RATE		CFM	ومنظر مزدو وهلا ميمر ميدو فديكر فوقاء وكيد فعدد فيزار فلكاء فليد فقدر فاردا فدود فارود والاز وفحل فقدك فيهم فيمر فيديا	AL 4450	2744
NUMBER O	F WINDOWS ACTING AS INLETS EAST WINDOWS	. [10 K . T 46 A4 44 A4 A4 A E4 E4 E4 E4 COMENTED TO THE TO AN THAT AND THE AF	34 34.	
	PR WINDOWS	1	10 · 0 ·		
	AW WINDOWS	1	0 71 " " " " " " " 7 7 7 7 7 7 7 6 6 6 6 6 6		
		i	l ·	-	
		i			
			· ·		
EFFECTIVENESS FAC	(00 (For Fo) 0)		. 22.4.44.6.46.4.46.426.6.44.48.4.49.48.6.58.6.48.6.48.6.49.6.49.6.49.6.49.6.49.6.4	p-17 p 10	
		1	• •• •		
		1			
		1			
		1			
			to the former of the control of the		
		1 .	·		
		1		_	
		1	. .	-	
		1	,		
		1		•	
		1			
		1			
			} · · · !-		
		1			
		1	-		
		1	· · · · · · · · · · · · · · · · · · ·		
		1			
		1			
Consumts	LOG BOOK PEYERENCY	PAGE			
COMPANY NTS	LOG BOOK PEYEBENCY	PAGE			

٢.

Ŋ

500

W N

传播

1

r S

Z

E. S.

88

			7/196
			HOU'S
			The Can
INITE IS OF TECHNIT			The Can fan fan fan fan fan fan fan fan fan f
DESMEN	METABOLIC + EQUIPMENT AND LIGHT NG LOADS	M317 200	· #1
	METABOLIC + EQUIPMENT AND LIGHT NG LOADS POWER METER READING	E-12	MAS ANT I MES MA MES AND
	POVER METER READING	MATERIA	
	INDEX (FROM POWER METER)	MSTU/KB	T
*****	DESIRED INPOT		1262 22 M / 23 m / 25 m / 25 m / 26 M / 26 M 25 M 25 M 25 25 25 25 25 25 25 M 1 M 25 M 25
	ACTUAL INPUT	10.00	370 200 MS MS MS MS MS 115 FOR 375 374 235 ALS AND 115 MS 210 110 145 145 140 110 110
	ENTHALPY	879/18	. 140
	B-PST	MST9 MA	a li 11 14 15 15 15 15 15 16 10 10 10 10 10 10 10 10 10 10 10 10 10
		1	
TOTAL SHELTES I'VE	ACT INPUT	MST9 748	■ [42] 441 410 420 430 430 400 405 405 405 405 405 409 402 409 402 409 405 405 405 405 405 405 405 405 405
		1	1
TEMPT AATORCS	PSTCHROGET'RS GRESHTANCE BULBS	1	team and the second sec
	CI CORRIGOR MORTH BRT		The way was an out of are not and the first to the transfer of the best the transfer of the tr
	C) CORRIGOS HORTE WST C) CORRIGOS SOUTH DRT	1:	The state of the s
	C4 COPPEDOR SOUTH WRT	1 7	THE TRANSPORT TO MAKE THE TAKE
	C1 CCSSIDOR CENTER DET	1 7	Ex a servir servir en experience de la la più do po la le la più de la più d
	CA COMPRISON CENTER WAT	1 2	174 ME US HE WE WE WE WE WE IS NO 140 120 126 116 110 HE 76 TIS TO TO 140 140 140
	C! AMMENT DOT NORTH WALL OF WEST WING	! :	He we me me we me me me me me me me me me the the the the the the the the the th
	CO AMBREST WAT MORTH WALL OF WEST WING	1 .	The series as a series we we see so the see see Libert its Libert as the MS to US JE
	C. AMBLENT OUT SOUTH WALL OF WEST WING	1 :	Do dro poo me me me me me me me me to the to the
	CHAMBERT ART SCRIP WALL OF WEST WING	1 1	Wing me me us as as as as as as as at the ato at ps ats at the he he he he he he
		i '	
		1	
		!	
		1	
		!	
	PSYCHROMETERS BERGURY BYER THERMOMETERS	1	
	GI CORRIDOR MORTH DRT	1 7	THE COLOR AND AND AND AND AND AND AND THE
	GZ CGRAIDOR HORTH WET	**	170 W. W. W. W. W. W. W. W. 126 110 NS II 150 IIS 115 115 116 176 176 IIS 116 116 116
	G) CORREGO -CENTER ONT G4 CORREGO CENTER PA"	1 **	The same of we we we to the tre made house which the me interpreted
		"	The second of th
	GS GORREDOR - SONTH DRT GS CORRESOR - SONTH WET	4	The state of the s
	OF AMBIENT HOT HORTH WALL DE WEST WING	1 1	The state of the s
	GO AMBERT OUT - NORTH WALL OF WEST WING	1 :	We at the walls with the we are the tot and the the the the for the the the the the
	W 22221 VII V 2011 V 20	1 '	11.
		i	
			the same of the sa
AVERAGES		•	1
AMBICKT	DET BULB TEMPERATURE		- \$10.00 ms marie recess and see use use the fire the thirthe use the the the the the me we
	WET BYLD TEMPERATURE	1 7	\$760 TES_TO WE ATO ATO ATO ARE ASS 650 665 CLS ATO GENERO AND THE TASTED THE THE WE WAS
	EFFECTIVE TEMPERATURE	1.*	The Military 10 Military 17 2 10 Line Military Teaters, No. 765, 765, 765, 765, 767, 761, 794, 794, 794, 794,
	SPECIFIC YOU THE	713/LDa	The matter of the transfer of the state of the state of the table to the part to the transfer the transfer of
	MENNET RATIO	18-/184	
****	DRY BOLD TEMPERATORS		the finance, where we decrease its the recognitive test testing for the processing observations of the financial financial financial for the state of the financial financial for the state of the financial f
	WET BULD TEMPERATURE	1 :	THE ME ME MAN, ME HE WE ME HE HE HE HE HE HO TO WE HE TEST A TOTAL THE ME
	EFFECTIVE TEMPERATURE	1 ;	the he me
	SPECIFIC VOLUME	FT /48m	A HI HO HO HO HO HO HI HI HI HI HI HI HI HI LI
	HTHERETY BATTO	19./10.	had not been and the time of the control of the con
		1	
		1	. ,
- Ind		f	the state of the s
WEATHER !	TEIDOLEY GIBW BABRE WOITDEBEEG GIBB	MATE.	देश के सब महें की कि हुई की कर कर कर कर कर मार्थ कर कार कर कार कर कर कर कर कर कर कर का मार्थ कर कर कर कर कर कर किस है महें में हैं जुड़ कर
	AMA DOSECTION	i i	
ecor	COUNTED BEARING &	Le COMPT	THE REPORT OF THE PROPERTY AND A THE PARTY AND AND AND AND AND AND A PARTY AND
	BMB VELOCITY (8 5 + 6, 75 + 8)	HPS	The second of the desiration continues and the second of the second second of the second second of the second seco
	WIND BLAKETION		WE SE SE SE SE NE NE NE NE NE SE NE ME ME ME ME ME ME ME ME ME SON SE SE ME NO WE NE
	PIND VELOCITY (TAYLOR WINDSCOPE)	B429K	167. 4.6.6.6 7. 7 7. 4 4 11 11 17 7 6 6 5 7 7 1
		1	
		ļ	· · · · · · · · · · · · · · · · · · ·
AM FLOW BASE		CFM	and stale and the self of the
		1	• • • • • • • • • • • • • • • • • • •
Mark a co	TOTAL PROPERTY OF THE STATE OF THE PROPERTY OF	1	[Hand = Note of the second of
	S# WE-BOWS	ì	
		1	<u> </u>
		1	
		1	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
		1	1
EFFECTPEMEN FACT	* ## F+1 0	1	gen has bed una dendo accidentace de de dece and new uses the dest ton men, one the mer tonible and
		1	· .
		i	* ************************************
		1	· · ·
		1	
		1	•
		1	
		1	· 1
		1	
		i	
		ł	
		1	
		1	
		1	the state of the s
		1	
		1	1 1
		1	· !-
		1	
		1	
		1	
			• • •
		ļ	
			;-,
SCHOOL D.T.	LOG BOOK BEFEBENCE	•ace	;
COMPAGNTS	ROG BOOM BIFEBENCE SPRACT	•***	17.77

University or humans Stream Resource Hall Charles to me a

Noveal Ventuation Test

Terr 2_ 15 .P. Dave 3-1844 7.1844

			7700
			Hor.
			The tree tree tree tree and and the tree are are tree are tree are tree tre
DITIALS OF TECHNIT	164	1	
BHELTER ENERGY IN DESIRED ACTEAL	POTS INCTABOLIC + EQUIPMENT AND LIGHTING LOADS POWER METER BEABING FOR CROWN POWER METERS	MRTUNE EVE	200 20 1 200 1 200 1 200 200 200 200 200
WATER	OCIMES MANI VCIAT MANI VCIAT MANI		I I I I I I I I I I I I I I I I I I I
	ENTHALPY	979/10 M879/MR	of olog on we at who is old
TOTAL MELTER EN		M919/88	112 mg as
TEMPERATURES.	PSYCHEOMETERS SEESSTANCE BULBS) C1 CORRIDOR NORTH SOT	١,	THE THE NEW ARE HAD HE HAD HE HE THE THE THE THE THE THE THE THE T
	CZ CORRIDOR MORTH WRT		
	C1 CORRIDOR SOUTH DRT	1 :	Kantone de me me me me me no De naza no no no file de file de cer ar ar ar ese
	C1 CORRIDOR - CENTER DOT	1 6	125 ho de die de jar de de No 115 100 715 100 715 145 140 710 114 at acces de ment
	CA CORRESOR - CENTER WAT C1 AMBIEN" BRY WORTH WALL OF WEST WING	1.7	The plane are are per due go in the PED PED TO DE DESTROATE CONTROL OF A CONTROL OF
	CO AMPENT WAT MONTH WALL OF WEST WING	;	white reces no in the reces of the treate prette to the the he is a con recess
	C+ AMBIENT BET SOUTH WALL OF WEST WING		THE MENT HE HE HE HE HE SEE HE SEE SEE SEE SEE S
	CHAMBIERT WAT SOUTH WALL OF WEST WING	1 "	
		1	·
	PSTCHEOMETERS PARROURY BYLD THEADYMETERS	1	
	GI CORRISOR - NOFTH BOT GE CORRISOR - NOFTH WOT	17	THE MISSES HE POLYMENT HE HE FOR THE TES TO THE TEST TO THE TEST THE HE HAVE NOT HE WAS THE TEST THE HE HAVE NOT HE WAS THE TEST TO THE HE HAVE NOT HE
	G) CORAMON - CENTER BOT		No THE MO HO WE ME HE HE HE THE METITE THE THE TIS SEC TIOTEE TO HE HE HE WE WE
	G4 CORRIGOR - CENTER WPT		105 tas no ne mo ne me ne ceo no tto tto ter ter the the the the the course ceo or cer are .
	G1 CORREGO - SOTH SET G4 CORREGO - SOTH WET	1.7	The Property of the form of the property of th
	GT AMBREST DET MOSTE WALL OF WEST WING		the bits his me we we are no me be the the to the
	CO AMBENT WELL HORTH WALL OF WEST WING	7	Proposition and the proposition of the proposition
			• • • • · · · · · · · · · · · · · · · ·
AVERAGES		1	
AMENT.	DRY BULD TEMPERATURE	7	THE THE NO. HE TO THE HE HE HE DO TO THE TO THE THE THE THE HE WE HE HE HE HE TO THE HE HE WE WE WE HE HE HE WE
	VET BULD TEMPERATURE EFFECTIVE TEMPERATURE		
	SPECIFIC TOLYME	813/L344	Total at an
	KINGOTT RATIO	13,/134	
SHEL TER	DAY SULS TEMPERATURE	1 .	BO 105 MS DOOMS ME HE NE DE BOOKS HO HE HE HE HE HE HE BE ON HOME HO HE . T
	WET BULD TEMPEPATURE	1 +	THE TENENT WE WE HE BE HE WE THE THE THE THE THE THE TENENT THE THE WE WE WE WE WE WE THE THE THE THE THE THE THE THE THE TH
	"FFECTIVE TEMPERATURE		104 104 NO NO NO NO NO NO NO NO 153 714 714 715 714 713 713 NO
	JPECIFIC VOLUME WYMMYT XATIO	15,/154	ا الله الله الله الله الله الله الله ال
		1	• •
PEO VEATRES	BUREAU WIND VELOCITY	2074	ता क्षित तात हित तात है। तात को तात तात को की की की किया है है। तात होते हैं। तात होते हैं। तात होते तात को ती की
-	₩₩₩ 6(FECTYON	1	
BOOF	COOMISH READING R WIND WELCHTY IS 5 + 0, 75 a DI	MPR	LLC COLLING ON PROPERTY AND
	WIND DIFFCTION	1	THE WAS IN ME IN ME IN ME IN ME IN THE PRESENCE OF EACH OF ME IN ME IN ME
	was artocist taution ambrecoart	HPH	•
AM FLOW BATE		СРМ	The way are the same and the way and the same are the same are the same are the same and the man are the man and the same —
STRAFF B	OF OTHOGOUS ACTING AS INTETS EAST WINDOWS HE WINDOWS	1	1
	in abiton?	1	
	y	1	
		1	1 1
		1	
	100 Gar for 10	1	
	<u> </u>	i	} • • •
		1	
		1	ř
		1	, m
		1	· = · · · · · · · · · · · · · · · · · ·
		1	
		1	- ' - '
		1	†
		1	1
		1	
		1	l · · · ·
		1	· ·
		1	•
		1	
		1	1
		1	-
		1	
**********	LOG BOOK REFERENCE		
Connerve	LOG BOOK REFERENCE	1	
			<u> </u>

P

50W-4ERTS

LOG BOOK REPEARINGS SWEARCY

University or Luners NAME VANTLATION TOT STUDENT RESOURCE HALL Terr 2 45 d 100 - OLLUMNITS HOLL.

HOLL OF THE RES CON THE NEW PARK THE PARK THE PARK THE THE PARK THE MITTINES OF TECHNITION BELIEF WITHOUT SPETI STATE OF He we we me me necessary the presence of the presence and necessary we are necessary the mean arms and the presence of the pre 197 67 67 67 69 67 67 67 60 to all to to the ap in an in a si or each ed FOTAL MELTER EXERCT MART CHANGERAL AST SOAM ANTFOLARST AND
CHANGES AS AND CHANGES AS AND
CHANGES AS AND CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CHANGES AND
CH TEMPERATURES. PSYCHROMETERS OMERCURY ACLA THERMOMETERS FIG. DI. HA TEP SET THE SET SELECTES SET SET SET SET SET SECRET AND ALL AND AL PATCHICOGRETIAN DELICYNY SOLD THEIMCHETS
OF COMMISSION - CONTRE NOT
OF COMMISSION - CONTRE NOT
OF COMMISSION SOUTH NOT
OF COMM 64 AMBIENT WET - NORTH WALL OF WEST WING ----77³/19₆₀ 77 77 51³/1.04 10₄/1.0₄₄ MELTER BOT BULB TEMPERATURE WET BULB TEMPERATURE EFFECTIVE TEMPERATURE SPECIFIC VOLUME HIMBUTY BATIO WEATHER ROBEAU 643 and acceptable and although the act also are as as a subject on the strong and acceptable and all the acceptable and all the acceptable and acceptable acceptable and acceptable and acceptable acceptable and acceptable acceptable and acceptable acceptable acceptable acceptable and acceptable COUNTED DEARCHS, & WIND VELOCITY (0 5 + 0, 75 + 0) WIND AMECTION
WHO VELOCITY (TAYLOR WHISCORE) AM FLOW BATE ER OF WRIDOWS ACTING AS BILETS ers was a ma no no peries na era a manes, do Ho se two species was a pro-------i

PACE

University of humas Student Resource How weeks haves

NATICAL VENTLATION TEST

Tesr 3 45 5 Dane 1714

			1-	_	_				_	_		-	11		-			_			_						_
1			ــا	:=	-	/**	į.	-	-	of-	***	/A i	-	-	no i		-		te.		an.	-		- 	<u>.</u>		
INDE IS OF TECHNI	Des		(,,		22		,	N	r.	3,	74	Α.	n	n.	1							نعت		ت	-	- 3	
MELTER ENERGY IN	PUTS				-		-												_	_							17
DESIAED	METABOLIC + EQUIPMENT AND LIGHTING LOADS	MOTUMA	,777	·		me c	wi.		*	***	717.	***	+514	v7. 1	٠, و.	1151	w4/ 6								***	- 7	
ACTEAL	POACS METER READING INPUT IF FOM POWER METERS	MOTO MA	. 44	436	~;	44.3	44.7	13.7	417	430	410	431	416	430	426	30		٠		44	110	410		,, ,	,, 47		,
1																											
WATER	DESIFED RIPUT	19/MR	345	31.0	24/	351	257	74.7	21) 316	7	21 24 <	37	213	25.1	25	17d .	٠٠. د د د		٠,٠	,,,	,,,,	210 210		;	46 30 E	,	
i	ACTUAL INPUT	019/40																									
l .	Det1	MATERIA	45	• •	10	Lø.	11	41	H	13	<i>1.</i> 2	12	12	L1	.,	Lo	•	•	-	• •	14	••	•••	• •	7.45		*
1		1	١			400	'				#43				w 7.	M									41 00.5	- 41	. 3
JOTAL BIELTER EN	INCT PART	MATTAN																									-
TEMPERATURES.	PSYCHROMETERS (RESISTANCE BREAS)	ļ	١																						5 7 7 5 5 7 8 6 5 5 4 5 7 1 5 6 7 1 9 0 7 1	_	
	C: CORRIDOR NORTH DRT	"	120	144	753	2	75 .	٠	720	***	715	10	foo	750	720	2.5	~~	~:	~;	~	22.6	~		•• ,	35 /75 40 (40		
	C1 CCANDON NORTH MAL	1 ;	545	775	iir	514	115	***	120	100	413	416	710	\$15	HO.	110	·		 - ,			~	***		15 12	-	
	C4 CORRIDOR SOUTH MRT		715	355	*5	774	76.5	770	***	710	Ħs	ter.	íce	145	710	Ho:	~-	••	≂ , .	•	**	~ ·	** *	e 1	56 7*1	-	
	C+ CORRIDOR CENTER DRT	-7	74.0	77.0	"	76.0	77.5	195	71.5	767	310	10	110	42	41 D	114	,,,	"··			•••	***		:::	** ***		
l	CT AMBIENT DOT NORTH WALL OF WEST WING	7,		254	175	95	125	'n.	76	415	110	110	115	cis.	150	No.				ŭ.					. 72		
!	CO AMBIENT WET MORTH WALL OF WEST WING	••	700	725	745	74	75.0	14.5	110	150	710	fo.	115	165	760	ı.	•	"	٧.,	"	~	***		•• 6	60 670		
Į.	C+ AMBIENT DBT SOUTH WALL OF WEST WING		745	454	***	7/1	774	110	7.7	800	10	170	430	753	745	190 I		mg mg	**	"	~-		"· ·	: ?	. 76 5	_	
1	CHAMBIERT 491 - SOUTH WALL OF WEST WING	• *	."	/31	′′•		.,,,		•••	110	•••	₩.		"				•	~-	•••			,	•	,		
!		i	•																								
i		l														-											
ł		I													_		_										
l		l					_				~			_								-					
I	PSYCHROMETERS SMEECERY BULB THERMOMETERS: G: CORRECOR HORTH DRT	١,	Í	250	*-	m		***	r1 <	410	9,0	7/*	21-	£7#	r. š	155				~ :					10 614 10 614 10 614 10 614 14 716 14 716		
1	GI COREDOR HORTE WAY	1 .	17.	20.	750	750	72,	755	765	775	110	720	770	72.	770	76.0	~~	٠.	ו_	~,	**			., ;	10 614		
1	GI COSANDON CENTER DOT		,550	#+ I		175	170	150	tLS	130	115	715	Ho	120.	67F .	6.0	***	٠	٠,٠	•••	•••				# 92.5	-	
Ι.	C4 COMBINOR CEALER ARL	, ,	72.0	3.	75*	760	77.	2:	110	777	215	*20	77.5	77.0	***	74.0 1920 .	::·	·	~ ·	"	~ .		::::	:: :	50 656 4 - 5 -		
l	GS COMMINGE SOUTH DAT GG COMMINGE SOUTH WAT	;	71	.745	755	25*	77.	7.	iv	100	115	72.0	65	72.0	715	<i></i>	,,,		۸٠.	Ÿ.		**	~/ ,		** **		
i	ST AMPRENT DRY MORTH WALL OF WEST WING	1	F2.e	80	"	105	111	10.	754	40.5	9. 4.	760	850	150	155			••		~~	**	~ •	·,	:	/* * TI 4	•	
i	GE AMBENT WET - HOSTE WALL OF BEST WING	-7	.70.6							120	.745	746.	750	35	755					**	.45	410		•••	40 67.	•	
i		i	•					•	-	•	•					-	~ •		•								
1		1	:	•											-		-:										
AVERAGES		1	i				_										· i		_						"		
AMBEST.	DET PULD TEMPERATURE	1:	77.	20.0	70.0	710	.114	71.	D.,	110	112	312	770	14.0	817.	23	,,,		***	~-	~5	~·	// /		10 (C		
į	WET BYID TEMPERATURE	.;	X.	75.7	7/0	125	12.7	. 720	ťΰ	es.t	SED.	5.3	112	10.7	1,1	19.	**	~ ,	٠,	**	*	**	47.	,	30 (C) 24 12 37 (3	77	Ť.
	SPECIFIC YOU UME	773/LO44	14.9	41	4.2	42	14.3	144	44	44	d.	MS	113	Mi,	H	٠.,	40		<i>~</i> .	**	40	~*	40.	**	18 13		•
l .	HUNCOTT PATH	10./10.	MDI	(1444.	, N.S.	, MA		يعجمرا		,		. 47.7	M1.5	, ادام	mm,	· · · · ·		٠	•	_	~~	٠.,		•••	****	,	***
MIG: 763	DRY SVIS TEMPERATURE		1895	-160	12 0		ñs	87.5	410	915	120	110	100	tte.	125	tio.		,ī.	•	•	 .	٠.,			25 ES	. 87	
	BET BUIS TEMPERATORE	;	.00	770_	75.5	75.5	154	740	770	720	78.5	714	725	175.	715	170	,,,,	•	٠.	,,	125	***	٠.,	••.7	74.5	7	5+
	EFFECTIVE TEMPERATORE	-	1751	,754	*	.Kf	107	1/1	45.	433	14.	11.7	135,	ŭ.	11: 1	117/	** 1	, د ٠٠	٠,	7.	100.	100	* * *	7	10 74.1 (4 74.1		
l	SPECIFIC VOLVING	57 ³ 18 ₄₀	100	71	101	11.0	A10	***	4.3			177	147	-	13.4 1186-	m.	~2.	≃.	~/	~	~	~,	~· /		7 19.		~.
1	INCOMEST PATES	100,/10	•				r							,	٠.,		,										-
		l	1								-						•	•	-					•			
#FATHER	BOREAU WOOD VELOCITY	N.FR	164	u.f	11	اعرا	41	le.	n.	15.7	123	بر و	133	126	127	45.	12	41	1.2	53	12	51	12 1		1 [2] 14 by	1 12	, a
	ALM BURECTION	1																									
8007	COUNTER BEARING B	≠ COUNT! MPH MPH	وروان	13K	ust	-64	423	140	ıbı	r a Min	154	1742	osa	1774	1143	1346	ن.	. 45	/						×1 (16		***
"	WIND VELOCITY (6 5 + 8 75 x B)	MPH	111	141	#4	120	197	153	157	**	rs.	15.5	42	04	14.5		50	70,	"	··	,,	~ 7	. o.	17.	19 #	- 4	7
	WIND MOECTION	1	.54	يء	2ñ	SV	22.0		2	دين	350	30	, žm	.번	-	٣	۳.		-	••	**	-	~ ·	٠.٠	~ ,~	٠ -	
	WIND AETOCIAL LANGUE AMERICONE!	HTM	; a	1	U	"	"	•"			-	•,,		.,	'^	٠	٠.	"	•	1	-	•	٠.	•	μ.	-	_
l		1	·	3000				:						_			'						•				
AM PLOW PATE		CFM	"	3000	-	-	-	-	-	_				A10	73(4)	,,,,,	<i>57</i> **	****	*		~~	700		econ c	** **	. 3	F/0
i	OF A PARONS ACTING AS INLETS. EAST WINDOWS	l	:~	-	-	-	٠.	- :	-					-	_	-	-	-	-	-	-	-	-	-			
	he emodes	l	1 *	٠	٠	٠	٠	٠.	1	<u>. y.</u> .	· 4	-¥	-1	¥_	4	٧.	4	4	•	•	1.	٠.	1.	٠,	+ 1		
ł	\$4 MBOOMS	l	-																-	***		-		*			
\		i	•								-	- :					***										
i		l					-			•																	
1		1		- •		•					•	•						•	•			•		•			
OFFECTIVENESS FAC	TOP #- F-1 %	1	159	٠.	-	-			-	-		-	-	•••	٠ 44 ٠		**>	* **	- 17	./1	-	0 SE	****	•••	~ * *	,	
		i	-																								
l		ļ										٠.						•									
\		1	-																								
i		l								_		_													•		
i		1	-							-																	
1		ļ	•																								
I		1	•								. :		•														
I		ł																									
l		l	ŗ																								
1		1	:								•	٠.	: '	•													
I		1	ť		-											- ;											
I		1	•										•														
l		1	:													٠,	•										
i		}	ŧ														•										
i		į	i								•												-				
I		I	Ī																		-	••	•	-	-		
1		1	ţ																								
I		l	ţ				•	• •												•	•						
650000111	100 BOOK STREETE	PAGE								Į.		•	•						-				•	-			
	MAKET		1							•																	

Z

University or humois Streems Responder Hadia Contable humais

NATIONAL VANTERMANTS TEST

Tear 3.4 15. 6

	CHAMBO ILLUS			Date Date	7.465	
			P3 .	Test of		
				HOU? 4 .f		_
				No. 154 No. 154 No. 154 No. 154 No. 154 24 24 254 264 Ste Ste Otto Ste Otto Ste	- oi. ivi	1
POTENTS OF TECHNI	Trin		<i>6</i> 1. <i>a</i> 1		CA ME SL	.
SPECTER CHESCY IN		1				╗
DESIMED	METABOLIC + EQUIPMENT AND LIGHTING LOADS	MBTOMA	4/	hts has said salestit, sir action to state the state of the control of the contro	715	٠,
ACTUAL	PO SES METER SEADING	Ken	434 433	100 747:711 7. have 778 770 710 710 710 710 710 800 700 20 20 20 20 20 20 20 20 20 20 20 20 2	A 0 75 2 310	: 1
	1659T IFSOM POWER METER)	HDTF ME	726 613	militarity world to you are to too be an experience or an ex-		·]
WATER	CELINGO BIPLE	10/30	34.0 33.5	- 7 87 319 312 312 312 314 315 316 316 317 11 11 11 11 11 11 11 11 11 11 11 11 1	444 327	- 1
	ACTUAL INPUT	LDMA	120 225	xi mi dring 43 to 34 of self 252 352 374 fizme int no ne no no ne ne	29 74756 194	
· 5	ENTHALPY	079/L0	****	To 10 17 16 16 15 18 18 18 18 18 18 18 18 18 18 18 18 18	13 11 14	. I
	NPV1	MATOMA	-, 0,,	to be as not a refusive as assessed as a second of a		· I
10741	TACK THE PARTY	M977,MA	43 5 44.2	765 W 1 TI S 776 761 985 W \$ 769 76 7118 766 928 A F 776 M 6 277 F 77 6 77 6 77 6	727 770 741	. 1
TOTAL BIELTER EM			:			
TEMPERATURES	PSTCHROMETERS (RESISTANCE BYLES)	1		other flat file was not the test than the te	** - ** *	- 1
	C: CORRIDOR NORTH DRY	,	2.22	7856 875 715 715 700 177 763 715 103 133 736 856,756 85 857 85 857 857 857 857 857 857 857 8	10 C 10 C	- 1
	C1 CONSTRUM NORTH DRT	1:	17. 17.	WATER FICTOR ELS HAD HARTO PED MO 135 OF OUT ME ME ME ME ME	45 110	
	C4 CORRIDOR SOUTH WET	1 : :	700 760	750 775 775 770 760 754 750 130 115 115 690 05 700 me me me ye ser se-	62E 630	- 1
ì	C1 CORREDOR CENTER DRT	1 4	125 115	910 17 5 17 165 165 155 170 135 125 120 120 No Ne Ne Ne ne e car al present	42.07	1
i	CA CORRIGON CENTER WAT		70 20	750 74 7 750 735 725 726 715 610 670 655 675 485 440 44 44 44 440 440	154_140	- 1
	C? AMBREST DOT NORTH WALL OF WEST WING	17	700 715	Ties tes ter ter in Self Militar tal res sident as me tre tre tre tre	C74 510	- 1
ļ	CO AMBERT SOT BOOTH BALL OF WEST WING 24 AMBRENT DOT SOUTH WALL OF WEST WING	;	715 75	THE MA TOO DO TIS TIS TES TIS 640 640 655 WE LED WE LED AT A	170 475	- 1
İ	CIPAMBLENT WET SOUTH WALL OF WEST WING		1615 7/0	235 73 5 720 115 700 615 US 650625 6W 640	530 510_	- 1
1	***************************************	1				
1		l	•			- 1
ł		i .	•			. 1
ł		ļ	t			- 1
i		1	I			1
1	PSYCHROMETERS MERCURY IN 18 THERMOMETERS	1	1.	TO SET SECTION TO THE	#c 200	- 1
l	CI COPREDOR NORTH ORT	,,	***	TEG 190 520 523 535 110 115, 110 125 115, 125 115 115 115 116 117 110 110 110 110 110 110 110 110 110	MA 614	
l	C1 CONTROL - CENTER BOT	7		TO THE THE MED ILS HE RESTRICTED TO THE ME THE ME HE HE AND ME	ne ne	
I	G1 COMMINUM -CENTER NOT	1:	70.0 745	210 7AF 720 765,700 700 640 440 450 655 65 620 100 00 00 00 100 00 00	war	
ì		1:	A. He	THE PART TENESS BLO JES AS PLASSIES FAS DO ME ME ME ME ME ME ME	BEBE	
ľ	C4 COMMINGE SOUTH DBT C4 COMMINGE SOUTH WAT	1 4	7.4,750	756,760,750,700 125,720 745,665,615,657 655 660,679,105,000, 00. 10. 10. 10.	ar u	
İ	GT AMBIENT DET MORTH WALL OF WEST WING		75.756	C 151 75C 75T 710 725 740 615 615 615 615 615 615 615 616 617 617 617 617 617	ne ito	4
	GO AMPRINT WOT MORTH WALL OF WEST WING		670-450	CENTERED FOR STANDARD STANDARD SAME AND ASSESSMENT AND ASSESSMENT OF THE PARTY OF T	141	1
1		f	;		-	
l l		i	Ε.			1
AVERAGES		1	Ĭ			
AMPENT	DRY BULB TEMPERATURE	-	20.710	e 150 He 760 NS 159 NO 115 NO 155 LES LES LES LES LES LES LES LES LES LES	(11° 110 114	: 1
	WET SWED TEMPERATURE	,	100 110	7. [14 7]4. 700 6]3_6(0,600,500,600,605,315,317,410,111,410,410,410,410,410,410,410,410	4541	
Ī	EFFECTIVE TEMPERATURE SPECIFIC VOLUME	F12/40-	Sec 34	He Be Be DE BE DE DE DE DE CE DE DE DE ME ME ME ME ME A. ME ME	Brur a	. 1
}	Imposed V BATIO	10./10	4077.685		MAN PART - NO	•
t						. 1
SHELTER	SAT BYLD TEMPERATURE	,	280.15	1975 NS TS 196 NO 196 NO 198 NS 198 NS 1906 NS 1906 NS 1968 MAY MAY MAY MAY MAY MAY MAY MAY MAY MAY	HO GO 61	- 1
	WET BULD TEMPERATURE		770 743	7,750,765 765 730 760 720, 710 650, 670, 630 615 600 600 600 600 600 600 600 600 600 60	79 2 340 75	اء:
ł	ESPECTIVE TEMPERATURE	F1 ² /3.0.	No. 10.1	HE HE HE HE HE HE HE IN THE HE IN THE HE WE WE WE WE WE WE WE	41 44 13	
	SAECILIC AOTANE	10-/10-	401.000	TOTAL COME STATE COME NAME STATE COME APPLACEMENT STATE STATE APPLACEMENT APPL	A78,000 -047	10
i	WY MARKET TO A KIND		{ ```			
		1	1			
- SALMB		1	ì	113 113 113 113 113 113 113 113 113 113	459 4TS 44 F	- 1
WEATHER	BUREAU WHIS VILOGITY	MPK		ONE OF HE WE'D DE DOE N N N N LOC N'N DE NE ME WE FUE E	6 E	- 1
1	THIS OWECT ION	1	i "		:	
1 1000	COUNTER BEADENG &	COUNTS	MARC ASS	d the transfere that may free doo like they free free tone to the tite on her has one	HIT LOGS 1 11	**
1	WIND TELOCITY (0 5+0 75+8)	MPH	13 62	80 H2 H4 HC 91 H1 IN ILE H2 IL2 ILO. 17 INO H3 NA 77 ING FT	TO 182 -10'	
	WTH DIRECTION	1	17	7 7 19 7 9 11 12 13 13 13 14 14 17 17 18 18 18 18 18 18 18 18 18 18 18 18 18	7 4	-1
l .	MIND VELOCITY (TAYLOR WINDSCOPE)	MPH.	1	1204 CONTINE LANGEST, USE 930 USE 1230 USE CONTINUE CONTI		-
		1				
AM FLOW BATE		CFM	500 TOK	BETTE FOR ATTO THE BUTE SETE STERLITECTED BE THE FREE AND AND AND ADDRESSED AND ADDRESSED	340 470 58	-
		{	! _	יש אב עם עם עם עת את יותיונת בנו בנו בנו בנו בנו עם עם עם עם עם עם עם	34 34	
12454F4	OF WINDOWS ACTING AS INLEED. EAST UNIQUES	i .	1	10 10 10 10 10 10 10 10 10 10 10 10 10		
	se wereovs	i	! '			1
	5# WB10#5	1	Ĭ		11	_
		i	E		-	1
ì		1		+ -		1
Į		į.	• -			1
	C708 (Fee Fe 2 %)	1] a pr o 50 a pr p qu p pr a 27 a 7) o 41 o 42 a 54 a 54 a 54 a 57 a 27 a 28 a 27 a 28 a 27 a 28	214 616	
CARTELIARRED AND	C700 (FAL 24: 4)	1				
1		ł				- 4
1		1		,	-	4
		1	•			
I		1	•		•	- 1
}		1	:	· · · · · · · · · · · · · · · · · · ·	_	ال
I		i				7
1		1	÷			
1		1	ŧ			
I		1	•	•		
l		1	ī			
1		1				
1		1	ļ			
i		ì	ŀ	!		
I		!	1			
Į.		l	1	•		
I		1	:	• ••		
I		1	i			
l		I	ŧ			
1		1	i	•		
i		1	ī	· ; · · · · · · · · · · · · · · · · · ·		
COMMENTS	I'G WOR REFERENCE	PAGE	1	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
	SORREI	1	1	****		
1		.1	1			

University of himois Street Resource Heil Incres hims

LE Occuments

THE T 45 7

	incres heres																						2	***	•	':'	٠.
			<u>'L</u>		_			_			_								_	_							
			_	Ja .	-						_	1.0	٠.		-		. –			. –							
POTENTS OF TECHNISMS				, se .				4					7)_								٠.,						AVE TL
SHELTER ENERGY INPOTS			,					-		٠.	٠.	^ -	-	~	**			14							-	-	
DEMAES METABOLI ACTUAL POSES ME	'` - EUROPHENT AND LICETING LOADS ; ER BEARING UR POMER METER!	MOTVAL EAR MOTVAL		13471 72 \$	613 6 18 5 7	71 o 6	51.5 76.0	7624 767	110	7577 18-	1740 115	-43 176	E/L*	14 s	ر ً،	145 I		~ / /		 // • ·	~	~	,		74	٠.	116 213 77~
WATER DESMEDO ACTUAL D	PUT	1 & ALB	145	39.j	**	٠.	155	He !	11.5	5	35.0	15	٧.	HL	145	٠,٠٠.	٠	• •	,,,	,,,		200	٠.	· ·	4	•,	254
ENTHALP		MPTF/AB	<i>i</i> •	45																						٠,	14
TOTAL SHELTER ENERGY INPUT		MPT# NA	١,,,,	***	177 :	~ ,	***	.,,		5		• •				•					-					•	***
C1 CORDS C2 CORDS C3 CORDS C4 CORDS C4 CORDS C5 CORDS C7 AMERIC C8 AMERIC C9 AMERIC	METAN METAN TO PERSO OOK NOTE OF TO OOK NOTE OF OOK NOT	* * * * * * * * * *	770 140 145 145 145 145 147 147	70 C (40 F 70 F	710 7 195 1 145 1 145 1 145 1 145 1 155 1 130 1	140 : 145 :	770 105 105 150 150 170 170 170	78 57 6 57 5 6 57 5 6 57 6 5 71 6 5 71 6 5 71 6 5 71 6 5 71 6 5	146	110 115 115 125 115 115 116 116	16.5 13.5 13.5 13.5 45.0 21.0 51.0 24.5 64.0	265 676 645 645 635 656 775 675	160 635 635 635 165 766 715 715	760 630 630 630 630 720 720 720 720	155 625 834 641 620 620 640 640 640	755		No :	**** *** *** *** *** *** *** ***	**** *** *** *** *** ***	M + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 +	70 C	****		Tel Tel Ite (Ite (142 141 145 15 15 15 15 15 15 15 15 15 15 15 15 15	
G: CORD G: CORD G: CORD G: CORD G: CORD G: CORD G: CORD	AUTIES OCERCIAT BITS TRESHONATES SO COM PORTS COT COM PORTS COT COM CONTRA WAT COM CONTRA	******	77 F2 65 67 67 67 67 67 67 67 67 67 67 67 67 67	# 10 110 110 110 110 110 110 110 110 110	nr:	no ur	774 495	HE GO GO GO GO GO GO GO GO GO GO GO GO GO	715	71. 	145	25	7 al 75 5 6 7/4 47/4	72 S	14 75 6 25 6 14 5 14 5 14 5 14 5 14	· ·		47 20 20 20 20 20 20 20 20 20 20 20 20 20	95 . 61 5 . 61 6 . 61 6 . 61 6 .	**************************************	 	70. 40. 40. 40. 40. 40. 40. 40.	~; .; .; .; .; .; .; .;	# 7 # 6 9 7 # 7 # 7 # 7	1/1. 1/1. 2/1. 2/1. 2/1. 4/1.	71. 71. 71. 71. 71. 71. 71.	
EFFECTIV SPECIFIC NOVEMENT T	D TEMPERATURE E TEMPERATURE VOLUME BATIO	F F F1 ³ /18 _{4s} 18 _w /18 _{4s}	12.5 12.5 12.5 12.5 12.5	140 640 645 145 145 145 145 145 145 145 145 145 1	7) 0 60 0 12) 134 pagi	7) T. (40 (71 (5)	77 6 7 6 7 6 1 6 1 6 1 6 1 6 1 6 1 6 1 6	110 (er 110	18,5 6+5 640 136	115 415 431 134	730 615 620 636	135 611 412 16	70 S	744 646 645 13.5	626 520 1 < 9 1 & 5	(90 . 530 457 . 136 .			400 400 459 459 449)	47 9 44 - 47 1 47 1 48 1	 	 	 	41. 41. 41.4	61. 61. 11.2. 11.2. 11.2.	314 (3.0 (3.1 (3.1 (3.1)	745 645 176 176
	TEMPERATERE TEMPERATERE VOLUME	77 10m 10, 10m	15.5	130 31 101	144 144 144 144	FF. To: U.S.	es t	156	150 131 183	650 136 128 128	455 776 ,30	11.	13.0 13.1 13.1	136	656 112 151 -78	125 726 13 P	# ·		77.	2:	~ / ~ / // // // //	~ · ·	****	77. 77. 77. 74.	727	71	\$2. 675 75. 117 117
AEVINED DESEVA	AND ARTOCILA			në Në																							
scor	*DISATIONAL SEVENCE B PROCODES **DISATIONAL SEVENCE B *** **DISATIONAL B *** **DISATIONAL B *** **DISATIONAL B *** **DISATIONAL B *** **DISATIONAL B *** **DISATIONAL B *** **DISATIONAL B *** **DISATIONAL B *** **DISATIONAL B *** **DISATIONAL B *** **DISATIONAL B *** **DISATIONAL B *** **DISATIONAL B *** **DISATIONAL B *** **DISATIONAL B *** **DISATIONAL B *** **DISATIONAL B	of comit	**	12 FAF 10	×;	E,	*	21	46	4 4	4 .	• 7	16	1.2	ſŧ	\7	2.3	47	45	46	10		47		7	77	7 3
			1	£11a	٠.	784		٠.,				744	6412		era	.	-			***					er e	•14	<i></i>
STEWNED OF WILLOWS	ACTING AS INLETS EAST WINDOWS SHI WINDOWS SHI WINDOWS			re			<i>~</i> -		/14			24												:	<i>7</i> .		
Tate Cluary to Tre Lide	ne fo 2 %		:	• **	.~	·-		.~		•••		a 57	***	• ••	, . .	٠.	٠.,	• 4.7	~~	6	•••	* **		٠.,			
											•		•		-											•	•
Chainer 17	TOO BOOK BEFERENCE	PAGE	-												.`												

, K

Ü

33

Ž.

ij

ĵ,

			Davis 731-6	
			000 000 000 000 000 000 000 000 000 00	
I III IS OF TECHS!	IN.		Me Na Pa Mu	Ave. JL
SHELTER ENER JO IN DESIRED ACTUAL	PLTS METABOLIC + EQUIPMENT AND INCHING LOADS POLER MATER READING (SPLT (FROM POLER METER)	MBTUNE ENR MBTUNE	175	725° 2/4 727
WATER	DAMPED DOPET ACTUAL INPLT ENTH UPP TOPET	15 MR 15 MR 5TO/LS MSTUME	†0→	375°
TOTAL SHEFTER EN			1	79.3
TEMPERATURES	ANCHORUSE EN MENDITACE DUESD C. CARRICOS NORTH SET C. MARINE SET C. MARINE SET SOUTH SET C. MARINE SET SOUTH SET C. MARINE SET SOUTH SELECT SETS WING C. CARRICOS SET C. MARINE SET SOUTH SELECT SETS WING C. CARRICOS SET C. MARINE SET SOUTH SELECT C. MARINE SET C. MARINE SET C. MARINE SET SOUTH SELECT C. MARINE SET C. MARINE		to the tor the total to the total to the total to the total to the total to the total total to the total tot	
	PATCHEOGRETES INERCEST BYER THERMOMETERS OF COMMENT OF THE CRET COMMENT OF THE CRET COMMENT OF THE CRET COMMENT OF THE CRET COMMENT OF THE CRET COMMENT OF THE CRET COMMENT OF THE CRET COMMENT OF THE CRET COMMENT OF THE CRET COMMENT OF THE CRET COMMENT OF THE CRET CRET COMMENT OF THE CRET CRET CRET CRET CRET CRET CRET CRE	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	St. 10 t. 10 10 t. St. 10 t. 10 10 t. St. 10 t. 10 t. St. 10 t. 10 t. St. 10 t. 10 t. St. 10 t. 10 t. St. 10 t. 10 t. St. 10 t. 10 t. St. 10 t. 10 t. St. 10 t. 10 t. St. 10 t. 10 t. St. 10 t. 10 t. St. 10 t.	
	UNI ALLO TEMPERATURE SET BULB TEMPERATURE EFFECTIVE TEMPERATURE SPECTIVE VOCUME KOMODIV BATIO	773/1844 13-/13-	ht no no no no no no no no no no no no no	740 624 673 137
	.BY B(LE TEMPERAYLEE BEF BYLD TEMPERATURE SPECIFIC VOLUME KKMIDITY B TRO	77' 1944 184 1844	200 T to 4,455 (45.	845 615 761 140
****	CREAS AIND NESCOSITY AIND ORSESTION	млч	E suc e se	80
вося	CONTERBEAUG 6 1 SELECTION - 175 8) WEETAN 1 SELECTION HAVE WAS DECORED	MPH MPH	magnetic care care care	. <u> </u>
// Mass cd	I IV ON CEPA IN EETS EAST ANDORS IN DISCOURS	CFM	0, 10, 10, 10, 10, 10, 10, 10, 10, 10, 1	2180
nice orie 1 ()	• • •		244 (4 cr) 4 #	-
		:		
COMMENTS	NO BOOK PEFFIRENCE SEPTIC	PAGE		

1-71- 1/2

University of Icinos Stronger Respense Hair Chicago Hiras

NATURAL PENTLATION TEST

Date 35.1

			.1-							_		_									_	_	_			
			izce	1300	ier	m.	-	126 /				+01			en.	-			,			_				An
SHELTER ENERGY IN																				- 10		_#	-		**	74
DESCREO	METABORIC EQUIPMENT AND ERRITING COADS POARS METER READING INPUT (FROM POWER METER)	MSTU WE KAN MSTU WE	745 243 745	22.1	175	2000. 78 5	yar Yu	9/14 3 145 1	12 2 11	699 37 67 7	51 3% (0 1%		,,	·-	~	,,,, ,,,,	7/7	70	 	 Fr.	702			***	191.9 74.1	2¥ 27 77
WATER	DESIREO DIPLIT ACTUAL IMPLIT ENTHALPY NORTH	LE TE LE TO/LE METO ME	351 7c	357	3,<	31) 31 o	385	45 3 312 3	53); 1 3	1 2 3 1 5 3 1	2 36 le Jk	ا جد ا د د ان		**	47	* .	A 3	# ·		777	300	171	4	,,	**	7
	acy nave	MATE NO	1																							-
TEMPERATURES	PSYCHIOMETERS (RESISTANCE BULBS)	MOTO NO.	ŧ																							
ner san sa	COMMISSION OF WORK (AT WATER AND A COMMISSION OF A COMMISSION	, , , , , , , , , , , , , , , , , , , ,	250255 CO 1000	150 150 150 150 150 150 150 150 150 150	•				~ :		: :	• •							•••	** 1	446	645	u_{s}	416	. 5 /	
	PATCHEOMATERS INJECTLY BYTE THE BANAGETERS OF CERTIFICATION AND THE ATTEMPT OF COMMON CANTER OF THE COMMON CANTER	, , , , , , , , , , , , , , , , , , , ,	He constant	Tre lies	19 L	795 1 1070 1 1070 1 1070 1	HE (15 74 39 44 55 65 15 69 10 87 10 70 65 73 10 67											710 150 507 725 750 150 150	FA4 674 700 700 F14 617	1) 0 10 0 10 0 10 0 10 0	**************************************	17 - 1 17 - 1 17 - 17 - 17 - 17 - 17 - 1	135 144 714 115 145 145 141	
AYERAGES			į				-						-													
AMBIEST	Day bulb temper lee wet bulb temperatibe effective temperatibe beceive volume numbity batio	7 7 7 7 7 7 7 13,113,4	786 135 714 137 1453	101 101	,,,, ,,,,	2 P 7	7	1 7	10 69 17 13	74	137	ورن پوسرا	.03		.77		es i	41	***	31	69.6 64.5	674	70 4	77	13.2	62 63
	DAT BLIB TEMPERATIRE WET BLIB TEMPERATIRE EFFECTIVE TEMPERATIRE SPECTIVE VOLUME HIMOUITY BASIO	F F F F F F F F F F F F F F F F F F F	20.00	70 5 d 10 5 d 70 d 1 d 1 d	95 8 9 000 1	74 5 8 54 7	756	10 50 65 60 10 11 11 13	70 82 16 48 14 75. 19 191	0 53 6 696 7 766 7 3 7	874 675 76 h	700		***	7.	~. ~. ~.	0) f 10 0 17 0 17 1	~. ?: ~.	~	115 655 760 131 1467	13.0 (* 5 75.9 (3.9 481)	815 680 75 1 13 1 , mg	13 0 +7 5" 75 0 13 1 sate.	135° 156° 117° 117°	140 140 140 140 140 140	61, 75 /3
WEATHER B	AND DEFCTION	MPH.	e×e	92 I	`& q € §	2 4	is i	5 13 E E	6 i, 1	s it i	į.	. 64 Exe	<u>-</u> •	5 E 5 W	٠ -	<u>۰</u> ۰	۰.	~ # 55 U	†L	c <u>-</u>	< i	-51 	/	7~	<i>y [</i>	,
acc r	CONTERBRADOS B WIND VELOCITY (6.5 M.S) WIND DELOCITY (1.5 M.S) AND DELOCITY (1.5 VEDDOC FE	P CUENTS MPH MPH	ene i	us : K		17 :	- S	1	77 444 3 6: 6 End	2 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	7 3 4 E	2 612 (014	41	#1 7 547 C4 =	· •	, 19.		9 Ja. 9 4 5	3 4, 5	12	0 es 1) 23 v	* 57.2 * 6 * 55.0	6 DE 1	47 1	7%	5
		1	ĺ																							
FIOW PATE		CFM		٠.																			1 (J. 1	7	· .	54
NUMBER CF	RDDOWS ACTING AS INJETS EAST AMOONS IN MIDDOWS SW MIDDOWS			- ·			- :	-		_	2 <u>4</u>	. 1	**	<u>:</u>		,	7	,	÷	;	7		,	7	-	
rijerinires a cu	ு மு. ரபா.		•	• •	.5 .	41.1	u ,,	is 11;			,	<u>-</u>	,	.,		14, .	•		17	• 4	. 25	'B .	. دد	4 4		
	: OG BOOM PEFFERVE												•							-		-				
OMMENTS		PAGE .																								

j

Code

Ì

			1																								
			1									10		_	_	-	-	_			_						_
1 3 00 11 00 1	,				رار مددر 2 - 3		L T	- JL	Ti.		- 200 - 370		. C.			,			(i.e.	SEE.	n	7.	7.	J.	JL.	J.L	4,
	N.D.	\neg															_										7,
	METABOLIC EQUIPMENT AND LIGHTING LOADS POWER METER BEADING (NPLT (FROM POWER METER)	MSTURS ROH MBTURS	777	720	15123	to 1	11 - 71	7 74	7 11	0 74	.7 17		· "						~ .		720	-	714	747	'	71,	7
****	DESIRED INPLT	LB/RE				,, ,	. 7	1. Ma	2 40		4 45	٠.,									24.0	** 3	201		4/4	9/6 403	4
	ENTHICPY	MOTO LB	15	14	16 1	ا ما	7 1	616			. /	.,,	٠,	. ,			,	,,	٠.		15	, ,	45	ś	1:	14	
TAL SHELTER ENG	BCY 14807	M810 NB	75 7	740 1	193	٠,	17 14	5 76	3 18-	476	37#	٠,٠	. 74		•• •	. ,	• •	747	<i>,,</i> ,	775	795	79 2	77 5	782	r -	776	7
EMPERATURES	PSYCHECHETERS (RESISTANCE BUIDS) CI CORRIDGE NORTH ONE	,	D.r	835	(40 p 115 f 125 f	40 B	SC M	5 (1	0 23:	5 55	513	50					•••	.,,		٠.	*15	1-0	٠,٠	5 5	٠.	115	
	C CCRRIDER NORTH COT	1:	Ho Do	124	685 6 125 F	to s	96 68 46 63	515	• 1.1 • F4	0 72 5 f¥	ᅘ	٤.						**		***	3/4	710	430	,,,		f35	
	C4 CCBFLAR SOUTH #BT	1 7	695	175	6806 155 ft	46 61	15 (4	5 13	• 12	5 73	P 74	٠ ي	• • •		•		** •		.,,		٠		74	7 +	.15	625	
	C4 COSSIDER CENTER DRT C4 COSSIDER CENTER WST	! !	42.5	150	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	13	te tri	5 12	0 73	2 8L	0 11 0 75		3 41	::			:: '	~′	~;	**	244	75	1.5	7/2	7(5	li o	
	C? AMBIENT DOT NORTH WALL OF WEST WING	1	110	120	135 8	10 M	50 12	5 80-	- 72	5 77	5 77	0 1	. "				٠.	***	~,	~-	140	746	7.0	pou	115	f.N	
	CA AMBIENT ABT NORTH WALL OF WEST WING		635	215	13 5 6 640 6	50 e	55 5 35 63	< 11	6 66. 5 12:	0 66 5 77	0 64 5 74	5.				::	٠.		:::	200	225	4¥ 4	755	715	414	133	
	CO AMBIENT ONT SOUTH WALL OF WEST WING COCAMBIENT WAT SOUTH WALL OF WEST WING	:	+67.	475-	L15 L	10 6	70	5 64	0 66	5 (;	5 . 1	ú					· · ·	.,,	400	٠,	45°E	459	144	, ir	696	415	
				•	-											-											
	PSTCHBONETERS MERCIAT BUIR THERMOMETERS)		1							-													•				_
	GI COPPIDIO NORTH DET GC CURRIDES NURTH WET	1:	41.	120	640 E 645 G 84 D B 675 G	45 4	70 6	5 11	5 %	5 72	0 73	5 ,		: ;	: :	,,					7 5		425	424	1		
	GI COSPIDOR CENTER TRI Un CCSPIDOR CENTER WAT	!	10.	tes.	\$7 D \$	15 F	on 88 os 70		5 91 • 77	15 7	e 21.	5 00 5 60	- 4	- 4	: :	:::		~-	**		710	nc.		•••	7/5	67 e 7) f	
	GA CCRATOOR SOUTH THE	,	175 100 100	***	teo s	15 +	e 8	* **	0.15	3 %	5 49	50			•••		٠.;		***	<u></u>	120	1/5		4 24	1	***	
	GA COMMITTED SOUTH WAT GT AMBRENT DRY NORTH WALL OF WEST WING	1:	100	. 24	620 F	10 6	** 7/ ** 4	5 72 No 14	. 76	0 77	10 74	54						;;	***	∵:	116	750	74.5	->-	725	5	
	F ABT NORTH WALL CF WEST WING	1	625	25	630 6	** 4	10 6	EN. 42	• 68	P 46	,,,,	5 43	5 4	• ,4.	** 4		راءو د	***	41	.,,	• • •	ر ۳,	644	•	J	40	
NEMAGES.				+	-					_		-	-			-											
AMB YT	A TEMPERATURE	1:	110	120	630 £ 660 £ 748 7 121 £	35 F	70.50	5 50.	5 LT	\$ 71 0 41	5 77 IA 67	5.	7 . 27		** *	ee .	***		×6		745	***	75 :	660	115	/3 c 47 5	
	THE TEMPERATURE	1 2	234	711	74.0	5 4 7	56 75	o 74	13	J 72	22	ź.	. "				۰٠,	٠,	**	**	-17	701	710	716	74 \$	754	1
	LUFFE VOICHE	FT3/LBa	121	124 MILE	121 (141% *	3 1 f.	25 e	4 AT	13) 13 (1,44)	13 13 75 42	25 -			-, :			<u></u> ,	187	~	103	/57 (m)	3 3	148	137	(1) (M)	
SKELTER	DRY BLIF TEMPERATURE	,	H									-															
	MET BUIL TEMPERATURE	1:	12.	105	150 8 267.6 76 7 7 76 9 7 180 1	45 4	10 61 70 72	15 71. 2 11	5 72 5 76	. 11 .3 71	. 77 177	2 "	5 41		٠.,	,,	70.	~~	712	»·	770	760	700	270	715	700 77∀	1
	EFFECTIVE TEMPERATURE SPECIFIC VOLUME	F73/184	40	190	// · 1	٧.	1.	0 14	. 14	6 14	• 11				. ,		···	,	/4.	٨.	170	H.		40	MO	150	
	HI WIDT T BATIO	19, 19,	***	- 4413	a-75 a	P41 .m		17 4.15		5 113	, 4		w,		٠,	.,	-7		~"			المدا	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	J#N	****	•••	
MEATHER	BUBLAU BIND VELOCITY	umi	6.	ı# 5	115 <u> </u>	4_داا	a f	2 3	F 2	3 3	5 5	8 1	2 11	5 5	8	١٠٩	58	5 %	58	46	58	ρį	12	12	42	12	
	WIND GRECTION	1.																									
BOOF .	COUNTER BEADING B	MPK	166	75	72 1	137	2 5	7 4	6 3	74	3 1	3 6		- 6	٠,	3	,,"	:7	59	44	25	**	6.5	4.	5.6	16	
	MIND DIRECTION MIND VELOCITY (TAYLOR WINDSFORE)		5w	55¥	17 0 72 1 3 7	5	s : 1.5	-	* E		€ 4		ē _5	٠,	:	3 1	5e 7	5	ž	5	5 -	•••	115m	na-	***	K N 7	
			į.		ne n												~										
P FIQUE BATE	W windows acting as shield East emon	cru	:"-	-			- 12	. /2	w /2	. ,,						e,						_	_	-	-	-	
NUMBER	Ne windows	•	-	,		- :	5 3	: -=				:	-		-	-	-	-	i	,	-	;		:	-	10	
	5W W0:00W5	'	,		•		•			•													-				
			:		-					•									:		-						
LEGINESES F C	tge of Fi+++	İ	* 17	•	A Y3 0	٠. ٠	٠.,	9 0	170	* J*	60.	24 ·	w o		•	٠٠.		• • •	• • •	· /#	*1	,,,,	٠.,,	4	440	05)	
			-										-							•							
			•																								
		İ										+				,											
																,											
		Ì	•																								
																								-			
OMVENTS	TOP BOOK MENTHENCE	***	; -	-																							
	MARCE	1	1																								

. . . .

			+-		_		_					_	_								_							•
				·	in	- 144	***	1000	//	- 040	1140	. ~~	m	Her	-,-	itu	150		c ar		<u></u> :				ine i	ne e	+1/	AVE
SHELTER ENERGY IN		$\overline{}$	-		_==		ü	-ii	بتت	-58	٠,	-24	TL.	<u> </u>	76	Ju	Jι	ΊL	11	نغر سا	_	<i>d</i>	4	٣	œ.	Mf.	21	J.L
DESISED	metabolic + Equipment and I runting loads Power meter reading Input (from Power Meter)	MBTU MR Keh MBTU NB	78.	5 → C3 · c i	774	- 305	3/4 /	135	7 ;	, ne .		724	77	- 11:	73V	9 5 a S	55X	75V)	23 % V 70	12 st	fr et		** 6	,,,,	٠, '	190 T	·-	725 2// 767
******	DESPED BIPUT ACTUAL INPUT ENTHALPY BAPUT	IS MA IS MA STUIS METUNE	40	* 42 :		17	440	***	***	***	•••	475	55	0455	77	ب 4 75	44	-	-	**	0 5	155	• •			٠, ,		*75" 10 *
TOTAL SHELTER EN	BGY INPUT	METERN	1			79.2																					. ,	78.6
TEMPERATURES	PRICES METERS MESTANCE BLEED CO CORROLL NOTE OF CO CO CO CO CO CO CO CO CO CO CO CO CO C	* * * * * * * * * * * * * * * * * * *	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	7 7 5 6 7 7 7 5 7 7 7 6 7 7 8 6 7 7 8 6 7 7 8 6 7 7 8 6 7 7 8 6	77.6	7.0 765 766 766 776 737 737	A	74 0 74 0 74 0 74 5 74 5 75 0 75 0 75 0 75 0	# # # # # # # # # # # # # # # # # # #	are are are are are are	75 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	98 : 974 780 775 775 775 775 775	74: 460 11: 12: 12: 12: 12: 12: 13: 13: 13: 13: 13: 13: 13: 13: 13: 13	796 374 70 70 70 75 75	714 714 715 715 715 94 716	11: 10: 10: 11: 11: 11: 11: 11: 11: 11:	5 Att. 5 Att. 6 Att. 6 Att. 6 Att. 6 Att. 6 Att. 6 Att. 6 Att. 6 Att. 6 Att. 6 Att. 6 Att. 6 Att. 6 Att.	18:00 18:00	5 年 5 年 5 年 5 年 5 年 5 年 7 日 7 日 7 日 7 日 7 日 7 日 7 日 7 日 7 日 7 日	5 # 10 5	- 11 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	6 14 15 15 15 15 15 15 15 15 15 15 15 15 15	5 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0	40 1	(c	1 () 1	75	
	PSYCHO METERS INVESTIGAT BLUE THE MAMETERS, GO CARRIAGE MORTH (RET CARRIAGE CARRIAGE MATERIAL CARRIAGE	1	75	* * *	10 mm	713 713 713 714 714	*	770 775 755	43	770	#	774	750 67. 730 730	50 50 50 50 50 50 50 50 50 50 50 50 50 5	77.5	12: 15: 63: 64: 71: 64: 71: 64:	913	920 77: 92: \$20 \$20 \$20	77	A	0 00 00 00 00 00 00 00 00 00 00 00 00 0	- 2.		70	77			
AMB'ENT	CRY BUILD TEMPERATURE WET BUILD TEMPERATURE EFFECTIVE TEMPERATURE SPECIFIC V.LLME NIM DITT PATIO	FT 1044 107, 1044	74.0	755	711	711	42. 70.	360 705 806 191	## T	#10 28 # #12		7/5 76 5 18 5 19 3	120 765 143 143 143	925 765 826 14:	929 763 823	105 205 205 105	755	#71 754 801	75.	0 75	a 44 0 75 9 75	• 11 10 71 11 71 11 14	1 C F	75 7 75 7 80 7	75 e	90 7. 10 7. 11 1.	5 0 5 1 1 1	P50 785 712 141
SHEL7E8	ONT BUILD TEMPERATURE NET BUILD TEMPERATURE EFFECTIVE VEHICLE RECEIVE VOLUME RUMID TY BAT'O	FT ¹ 13m (19 ₁₁ 13 ₆₁	t																									
WIND WEATHER	PLREAL WIND VELOCITY	штк	ļ -	9,2 S	15	11.5 نيون	ربر 5 1 8	s	rs S	138	i. 1	13 4	115 J S J	115 5w	9 I 55u	12	69	5 ¥	51	5	5	k 5	8 Y	26	.1 ·	ان د نون		8 ¢,
B 00-F	COUNTER BEADING B WHICH VELOCITY IS A R. B. WHICH WELLOCITY ITAYLOR WINDSCOPE)	OF CLUNTS MPH MPH	•5			135		٠.	115	120	1154	1.00	o n	1		7 % 7 %	0.1	613 61	57	2 (11	٠.,		٠,,		***		٠,٠	6715 E?
A P FLOW PATE		CFM	שוכ		,,,,	444	,a.	wee	٠, ,	٠,		40 50	-212	4124	570	3444	4664		_	13.	. 190	. , .	,	20 1	.,,	4 P	٠,	2/8.
N MRES O	#INJOREALTING AS NEETS KAIT WINDOWS NW BINDOWS SHE WINDOWS		; - :		,	,		-	~	-	. ,	_			_	_	7	2,	-	;	Ĩ			-	ĩ	,	-	
<u>LEGRETIAN PROP</u> ÉVEZ	OR FE10		: 	-		r32	٠,	e vø	c 16		• • •	. . +	35	471	27	4	aši	-	_			, ,	11 1	• •	31 C	, ,	7	
						-											1											
CORMENTS	OF BOOK PEPEPENCS V BACT	PAGE .																	شَد									

1

######################################				•																								•
Section Control Cont				1						_		_	_															_
### 1				-										<u>٠</u> ٠			·		·			30			-			
### 1	5 09 TECH "			1	~	Lee	Cer	Lee		. (50		cies	JJL	m	771	35L	371	700	FTL	75.	~	40	-	40			71	- 3
### 15 SECURE CHAPTER STATES 1985	WELTER ENERGY IN	PLTS		1								••••																
Comment Comm	DESIDED	METABOLIC + EUL PHENT AND LIGHTING LOADS	4970 90		· •																							7
Comment Comm	ACTUAL			2000		~	~,					-	723	77.7	177	741	774	77.	177	21.6	20	7.	7.	77.	771	. 710	7.4	
Comment Comm		INPCT (FROM POWER METER)	MATCHE	1																								
ACCORDING 10 1 1 1 1 1 1 1 1 1	*****	DESIRED DIPLT	12.00	50 5	***	15 .	***	** 5	***	***	46	**	- 🗪 ₹	524	475	446	494	505	444	427	475	111	410	451	+ 44 5	\$ 45.5	4,5	
MATERIAL CONTINUES AND MATERIAL CONTINUES		ACTUAL INPUT		.00		٠.	** 5		***	•	**	***	5/5	575	57£	+50	465	5/0	620	5. 5	4-	5.	~		+7	٠.		
## 19 A STATE OF THE PROPERTY				4.	*																				٠.			
Commonwealth and recording all Commonwealth C		INFUT	MAIN		•	·•	′,	′•	′•		′•	′ •	٠,		20	.,	/7	~	•	, ,	•	•	,	- / /		. 1	, ,	•
Company Comp		*** I. ****		٠., -	***	<i>78</i> 1	746	~,	76 1	78 4		N 3	<i>p</i> - 1	78 \$	73.7	199	79 3	710	71 8	780	4,	75 ÷	700	790	744	741	7/7	-
C. CRILLOW SATE SATE SATE OF THE CONTROL OF THE CON	CIAL SHELLER LA		30 TO																									
C. CRIAGO NATIO STATE AND CONTROL OF THE STATE	EMPERATURES	PSTCHECHETERS RESISTANCE BLUBS	1																									
Control Cont		CI CCRRIGOR NURTH DET		. " 5		~	~	***	***	•••	***	***	***	900	105	140	145	425	512	270	715	44.0	22.5	59 0			286	
Control Cont		C CORRIGOR NUMBER WAT		rr.		:::	- :	~	***	-				***	200	44.5	666	64.5		***	77.5	740	***	***			- 77 5	
### CARRIES VARIED AND STREET AND		I COPPLIED SOUTH DET	!	Sec. 5		***	7.	,,	57	70.5	70.6	**	785	770	110	120	450	140	135	1/5	2/5	vic	***	***	3.4	74.5	700	
### CARRIES WHILE ### CARRIES			1 :		10 6	***	***	***				Fe	905	915	410	115	910	405	405	810	115	19.	115	100	110	564	115	
### CARRIES WHILE ### CARRIES		CA C APIDER CENTER AND		100	.,.		•••	**	775	,,	"	700	720	780	190	its	115	845	130	715	The.	115	72.6	300	· co	, 🔫 5	715	
### CARRIES WHILE ### CARRIES		C AMBIELT DET NORTH LALL OF BEST WING		1176	**	٠.	• /	***	815	•	***	***	1/0	*20	825	115	270	785	775	700	× .	74.0	. 35.5	790	D:	5 700	, ~	
### CARRIES VARIED AND STREET AND		CO AMBILAT POT NOOTH WALL OF MEST BING	,	-3.					25		***	75.0	755	760	753	743	720	490	743	730	IJΣ	77.5	70.5	74.5		78 :		
### CARRIES VARIED AND STREET AND			,	176		**	٠			٠.	~:		700	700	777	710	110	775	776	750	73.0	750	45	796	-111	111	79.4	
CARDEN SALE PARTIES THE PARTIES THE CARD AS A SALE PART AS		CINAMBIENT PRE SOUTH WALL CE WEST WING	1 '	1	/••		•	,		•	•	~			,,,,		193	,	,			•				٠,	,	
CARDEN SALE PARTIES THE PARTIES THE CARD AS A SALE PART AS			l.	۲.			-															_		-				
CARDEN SALE PARTIES THE PARTIES THE CARD AS A SALE PART AS			1	:																		-						
CARDEN SALE PARTIES THE PARTIES THE CARD AS A SALE PART AS			i	į.																								-
Processing Section Color Color The Transmitter Color			1	ŀ					_						-	_			-							_	-	-
UNITED AND A CONTROL OF THE CONTROL			1	Ť								-		5								-						
UNIONE CONTROL STATE OF THE STA			1 -	lee.				.,	***		-,		***	***	655	140		675	100	ñ.		7.	77,	***	40	7.	7.	•
CONTROL OF THE STATE OF THE STA				100			**	".	***	**				800	עעד	740	705	Us.	\$15	500	25.6	frr	٠.,	٠.,	700	***		
CONTROL OF THE STATES AND A STATE AND A ST		GI CORREDOR CANTER DRT		[-,,		•/•	**	٠.	17.0	40		~	7**	45	f6 c		7ac	926	926	935		120	25 5	- 100	4/	496		
CONTRICT AND ADDRESS OF THE STATE OF THE STA		LA CORROCE DE TER MET		100	## c	•••		•••	***	~ .		***	n	135	745	*75	*	as	135	***	FA F		7	. •, 5	. 271	. 4	٠.	
CO AMAL TO SELECTION AND THE COLUMN		UNICOPPLICE SITH DBT		1.50	***	***	•••	***	***	~-	~-	***	7:5	*~	115	\$25	*.5	700	175	10.5	54	25	к.	٠.,		e ee.		
MARRIET APPERS TEMPERATURE ***COLUMN AND APPERS TEMPERS		GL CLER DUR SOUTH MET	,		**	40	"		: '	***	***	***	775	777	62	7.	100	A35	.145	20	ш	2:	190		77	300	710	
MARRIET APPERS TEMPERATURE ***COLUMN AND APPERS TEMPERS		GT AMPLE T DRT NERTH HALL OF AEST WING	1 .	120	76.6	ς.	×.	-	·.	72.	~:	~		257	7/5	720	7/2	210	720	215	244	-,-	. 71.6		77			
MARKET AND RECEIVED AND AND AND AND AND AND AND AND AND AN		CI ANDRES OF PART CYPIN BING	1 .	1														٠.										
### 15 TO TOTAL STATES 1			1	1																								
### 15 TO TOTAL STATES 1				+													-											
WESTER DEPART STREET ST				1		~.						414	***	*/	***	785	770	780	775	15_	n:	tes	· ×	740	. 77.	. 710	70 4	
### (F. & 1) ###################################	AMP IL VI		:	F- 6	20		~.	٠,,	٠,,,	20	711	٠.,	770	115	770	130	730	715	770	780	73.5	25	725	- 75 5	573	754	73.0	
WESTER DEPART STREET ST		FFFFCTIVE TEMPERATURE	1 .	1	151	75.5			***				828	14 9	119	757	750	757	153	143	705	705	79 2	***	1,73	c 13 5	21.5	
### (F. & 1) ###################################		SPEC TIC VG I ME			a,	.,,	100	100	101	~	142	~ :	45	142	. 42	,139	124	13.9	1,37	137	129	15 🐔	D 1	1 15 4	e e		11.5	
### CONCENTRATION		HUM US R II	il a . bda	١.		**		*	, .	· • ×		•	***	UT	***	****		~"	, ,	**	* 172	. ~~	* ***	٠,٠,		4 (1)	t March	
### CONCENTRATION			1 -	1	***	٠.,						•••	· a	410	ov <	870	175	164	115	115			- 14.0	- **	- 00		- ***	
######################################	***	ALT BLUE TEMPERATURE		1.2-											210	705	***	620	44 .	60 C	120	*10	**		* 43 1		- VI .	
THE THE PRINCE STATE OF THE PRINCE STA		ESFECTIVE MPERAT RE		195 1	#5 w		***	** *	213		***		**	541	120	riĝ	657	45.4	153	15c	***	153	151	1 . :	2591		536	
### CHARLES BLEAK ***CHARLES		SPECIFIC 401 DML	FT' IBe.	19.9	144	14 4	14 8	101	/* 1	14:	**/	*3	177 1	175	14 2	14.5	14.9	***	144	14.4	14.3	19.9	14.4	44	, ,	10.3	N3	
WEATHER REPORT WHO PROCESTS WEATHER REPORT OF THE CITICAL STATES AND A STATES AND		HI M. IN BATIN	18. 18.4	hy-m	*187	••••				* ***	,	•••	, ~	~		4 ,4,1	130.44			#4K57	A-12)	~~	4344				+ 2463	
### TO STATE AND THE COLOR STATE OF THE STAT				Ī															•		-							
### TO STATE AND THE COLOR STATE OF THE STAT	(IND			Ī.,								_								٠.								
### CONTROL OF THE PROPERTY OF	MEATNER		MPH	1 7 4	524	**		- 1	7.	44	. 15 t	- K.	-	about	4.0	0.2	1=	540		216	Evé	116	26	E1	124		// > 558	
### ##################################		PACTIBLE IN		i'~																						•		
### 1 1 1 1 1 1 1 1 1	PET	GL NEER PEA NOL B	IN COLNT	ı,		Ø 534	0445	• 14	100	10		1/14	/ / 637	2154	1596	1430	0647	0145	463	6721	ere	* 172	n (43)	1 +1		· un	40	
THAT I SALE OF THE		AIND VELOCITY (C. S. 4.75 A)	MM	; -		51	**	75	**	٠.	/4 5	"	131	14 5	174	178	61	74		47	54	"/	_ * 2	43	-:	٠,	76	
THAT I SALE OF THE		WIND PECTRA		÷		***			**	5-			54	54	. 550	₩.	سيد	we	ric	SSE.	554	w		14	- 5	.5	SL	
THAT THE SECOND SECTION S. S. S. S. S. S. S. S. S. S. S. S. S.		AL . E . IT (TATION WASHINGTON)	MPK	;	~	ć.,	6		•	٠	,	"	15	11	20	₽.	. 5	7	6	2	2	,	,	2.	.*	11	7	
THAT THE SECOND SECTION S. S. S. S. S. S. S. S. S. S. S. S. S.				ĺ																								
TELTHYSIS TECT 1 17 1 10 10 10 10 10 10 10 10 10 10 10 10 1	FICT PATE		CFM		100	26	1900	700	,,,		. 3174			KISO	2 444	557 •	4370	1910	1800	24		,	17%	,	110	نبرز	2,23	
TEATHWEEN FACT 3 IF T I III (10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				٠.	_		_						_	_	_	_	_	2.	20	15			٠.		٦.			
TEATHWEEN FACT 3 IF T I III (10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	A With								- 1	,	~	~	-	_	5	-	-		•				٠.					
TESTINGTON TECT > 17 F 10 (10 00 00 00 00 00 00 00 00 00 00 00 00 0		CH WINDHAS	1			•	٠,	7	- ;		~7	٠,	-7	- 7	-,	-	2	_	_	/2	1.		1-		- 1	٠.	_	
THAT THE SERVICE TO 17 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		5# W/COC#5	1	1									_				_		-		•							
THE THE SECTION OF TH			1																									
THE THE SECTION OF TH			1	٠							•									t		-						
IDMANI CO DOS MITTILIZES PAGE			1																	•				•		•		
IDMANI CO DOS MITTILIZES PAGE	FEE. TIVENESS FAC	T # (F F 1 9)		14	**		•~	• , ,		.,			r a 2	cn	_	a .	03/		3 20	0.70	ø 25		(4)	> 24	بده	6010	. 22	
INVESTIGATION OF THE PARTY OF T	<u>FAC</u>		1	-															-									
INVESTIGATION OF THE PARTY OF T			ł																			-				-		
THE CONTRACT OF BOLK REFERENCE PAGE			1	•																								
THE CONTRACT OF BOLK REFERENCE PAGE			f																									
THE CONTRACT OF BOLK REFERENCE PAGE			ł										-															
THE CONTRACT OF BOLK REFERENCE PAGE			1																									
THE CONTRACT OF BOLK REFERENCE PAGE			1																									
THE CONTRACT OF BOLK REFERENCE PAGE			1	•																								
THE CONTRACT OF BOLK REFERENCE PAGE			1																									
THE CONTRACT OF BOLK REFERENCE PAGE			1																									
THE CONTRACT OF BOLK REFERENCE PAGE			1	1																								
THE CONTRACT OF BOLK REFERENCE PAGE			1											-														
THE CONTRACT OF BOLK REFERENCE PAGE			1																									
THE CONTRACT OF BOLK REFERENCE PAGE			1																									
COMMENTS OF BOLK RETERIORS PAGE 26			i	-																								
COMMENTS OF BOLK RETERIORS PAGE 26			1	-																								
CHIMENTS OF BOLK REFERENCE PAGE ,			1													٠												
CHIMENTS OF BOLK REFERENCE PAGE ,			1	1																			_					
CHIMENTS OF BOLK REFERENCE PAGE ,			1																				_					
CHIMENTS OF BOLK REFERENCE PAGE ,			1	*																			_					
CHIMENTS OF BOLK REFERENCE PAGE ,			1	1																		•						
		CC. NO. E REFERENCE	PAGE	-											2.								•	~				

theres we see the best there are and the see t

NATRAL ENTLATION TEST

7 .5 .7 Dave 7-3" us.

				_
			050 Chan Chan Chan Chan Chan Chan Chan Chan	vE
1 (j.) 15 F FCH 1			pro - Cro tre Cre te ten ven fen It It	
SHELTER ENERGY IN	PLTS. METABORIC FURIEWEST AND LLMING LOADS	MATU NA	7x 775	5
ACTL 1	PO LES MATER SEACING	I K A M		4
	INPUT (FRUM POWER METER)	MATURA	13 10 10 10 10 10 10 10 10 10 10 10 10 10	
*****	DESTRED INPLY ACTUAL INPLY	3 W2	\$425 407 407 416 425 4 6 425 416 427 446 45 546 6 \$46 4 - 423 415 125 415 416 420 446 45 515	. 5
	ENTH LPY	ATU LB	[4	,
	INPUT	ABIC NO	Na and an analysis of the same	
TOTAL SHELTER AND	A JAPANE	MATC HA	HA TT- TC+ 781 T81 T81 T81 T81 T81 T81 T81 T87 T71	*
TEMPERATURES	PSYCHROMETERS (RESIST NO. P. BS)	1	· ·	
	CI CLEBICE ACRTH ONT C CLEBICE N RTH NRT	1	THE BACK AND A MICE AT A MICE AND AND THE SEC NEED AND AND AND AND AND AND AND AND AND AN	- 1
	CI CLEADER SOUTH DET	1 7	I . He will the to be me me mit fif bt. tes	
	C4 CCBBIDCE SULTH #BT C4 CCBBIDGE CENTER #BT		The state of the s	
	CO CERRIDAR CENTER ART		16 to the training of the training of the 160 to the training of the 160 to the training of the 160 to the training of the 160 to the training of the 160 to the training of the 160 to the training of the 160 to the training of the 160 to the training of the 160 to the training of the 160 to the training of the 160 to the training of the 160 to the 16	
	CT AMBIENT OBT WORTH AND OF WEST WING CO AMBIENT ABT HURTH WALL OF WEST AINLY	1 7	"10 728 > 18 26 730 730 760 763 760 765	
	C AMBENT OF SOUTH WALL OF WEST WING		The form is a second to the second of the first the first fi	į
	CHAMBLES ARE SCUIN WALL CO WEST WIND	_ ′	*	
			•	
			1	
		1	1	
	PSYCHEC METERS (MERCLEY BULB THERMY METERS) GI CCRE,D B NURTH DRT		15. 4 5 10 4 10 4 10 10 10 10 10 10 10 10 10 10 10 10 10	
	G. CORROR NORTH WAT	1	THE BLO BLO ME SEE BLO BOS BLO HE BLU BU THE SEE THE SEE SEE SEE SEE SEE SEE SEE SEE SEE S	
	SE C PRINCE CENTER SET	;	to at at the pt was the me for to the	
	GA CORRIDOR S UTH DRT GA CORRIDOR S UTH ART	:	The me of the see the see or, me the five to	
	GF AMBIENT DET NORTH WALL OF MEST MING US AMBIENT MET NORTH WALL OF MEST MING	1	The state of the s	J
	US AMBIENT RET NORTH WALL OF WEST WING	,	The state of the s	
			:	
VERAGES			"The tree the tree tree to the me and the city of	10
AMBIENT	ERY BULB TEMPERATURE WET BULB TEMPERATURE	1 :	"1 . * 5 No NS of No NS No NE 155 765 765	-5
	EFFECTIVE TEMPERATURE SPECIFIC VOLUME		1 Top 2 of Mark 1 Mar 100 Mar 100 Mar 170 Mar	11
	HUMIDITY BATIL	10. 15.	gas to all sear to a transfer of the a total of the sale of the sa	1
SHELTER	CRY BULB TEMPERASURE	,	B.C. AS. AS. AST ALC ASS NO ASS ALS 110 475 475	٤.
	MET BUID TEMPERATURE	,	"To me had the ride to by the my to the 195 795	**
	EFFECTIVE TEMPERATURE SPECIFIC YOLLDME	FT' 1944	BA 102 101 0. 02 102 102 102 102 103 12 112 112	Y
	HUMIDITY BATIO	18, 18,4	The server of the serve has a ser had the 670 CES ST. The server had the server h	,,
		1		
WEATHER	BUREAU #150 VEGOCITY	мэн	110 178 81 3 4 4 5 50 101 10 5 \$1 10 5 42 150 115 5 48 15 5 5 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	
	WINC DIRECTION			
poc F	CUTATER BEACING B	IN COUNTS	Const The ran was also be refer to the characteristic flow Const	*
	MIND DIRECTION	1	S S S S S S S S S S S S S S S S S S	
	PIND SECOCITY (TAYLOR WINDSFORE)	мэн	7 7 2 N 8 12 4 R 9 3 G	
		CFW	4 cam sees 274 sec 274 sec 274 vess am 4 to 5560 verto 4	040
A PICK PATE		1	P	
MC MBER C	F AIN KIRS ACTING AS INTERS EAST AINDINGS NO RINGOLS	I		
	SW WINDLWS			
		i	+	
			Ť	
FFECTIVENESS FAC			ent out any tre entre a site entre 200 and	
ELECTORISM FRE	.00		•	
		1		
		1		
		1		
		1		
			1	
		1	•	
		1		
		ļ		
			-	
COMPLYIS	IOG N. P BEFFFENCE	PAGE	• • 1	
	MARCI	1		

 $\tilde{\chi}$

4.4

353

Ŭ

>

3.5

1

8

· ·

F 11 5 5 18 8 1			
F 11 5 5 15 56 1			MOL / -
			The chart and 2 for the four one of admits of the other four other four other than 100 four but N for The Tr Tr Tr Tr Con Con Con Con Con Con Con St. Tr Tr Con Con Con Con Con Con Con St. Tr
	e /s	т —	
DESCRED	METABOLIC + EULIPHENT AND LICHTING LOADS POARE METER BEADING	METU NE	115-2
ACTLAI	POACE METER READING	K+H	THE CONTROL OF CONTROL OF SEA OF THE CONTROL OF THE THE THE THE THE THE THE THE THE THE
	(APUT (FROM POSER METER)	METUNE	1 TUT 756 TULTER ME TO THE NE THE THE TO THE TO THE TOUTED
		1	THE WE WELL S. C. C. AND THE SECOND SEC. IN S. W. C.
WATER	DESIRED INPUT	LB 748	155 465 455 465 476 476 476 427 407 378 388 388 378 147 158 467 445 446 435 466 474 488 468 488 488 488 488 487 487 487 487
	TATHALPY	6TU.48	40
	PART	P10/12	17 18 17 18 47 18 19 18 18 18 17 18 16 16 17 17 17
	NPCC .		
TOTAL SHELTER EN	TRUY INDUST	- CRTHNA	127 18 17 3 714 772 Acc 20 20 20 20 20 20 20 20 20 20 20 20 20
	Transport		4
TEMPERATURES	PSYCHECHETERS (RESISTANCE BULBS)	1	1
	CI CCRRICH B NORTH DRT		105 776 325 722 775 880 ME NE DEF BANKAR BANKAR BANKAR FOR TO FEE SES 105 125 115 115 115 115 115 115 115 115 11
	CZ CLERIOLE NORTH WET	1 *	THE TEN TEN TEN THE THE BLE BLE BLE BLE PER TEN TEN TEN TEN TEN TEN TEN THE
	C) CCBB E B SOUTH DBT		\$22 Pro And Par his san me me use me us mo 123 to the bro
	C+ COSAIDOR SOUTH WET		10 10 10 10 15 110 75 77 10 0 0 7 7575 76 76 165 750 165
	CS CCOBIC & GENTER DBT	,	THE STORY OF THE THE STORY OF T
	Ch GUBBIDOS CENTER WAT		195 NO TELL TELL PLANT OF ME AN ALL ME THE PER TO DESCRIPT OF THE TELL TELL TELL TELL TELL TELL TELL
	C' AMBIENT DOT NORTH WALL OF WEST BING CO AMBIENT #)T NOOTH WALL OF WEST BING	1 1	130 100 100 130 150 Mayor was well you have 23 10 33 355
	CO AMBRES WITH STATE OF STREET	1 7	Our die Cha f. C. file die me Mr. me me me me me me me me me me me me me
	C+ AMBIENT OBT SOUTH WALL OF WEST WING CICAMBIENT OBT SHATH WALL OF WEST WING	1 1	\$75 780 745 700 746 76 76 76 76 76 76 76 76 76 76 76 77 75 74 7755
	CITAMBIENT ABT SICTH WALL CF WEST WING	1	
		I.	<u>k</u> =+ +
		1	F '
		1	
		l	
		1	
	PSYCHOMETERS (MERCLAY BUID THERMOMETERS)	1	
	GI COMPIDER NEATH DOT		\$70 HI +76 420 865 40 + 41+ 41+ 41+ 41+ 41+ 41+ 41+ 41+ 41+ 4
	GI CORRIDOR NURTH WAT		\$70. \$11 +70, 470 (5.5 d. 0.0) o see ore ore ore in one of o set of a - 000 fets 715, 770 770 155 712 DOS 9 o one roo nee its nee roo roo 25, 720, 770 175 fee 570 152 fee ore no me me see see ore of see see dee see see fee
	G1 CCERTING CENTER DAT	,	\$275 FPG \$76 \$76 \$15 \$16 \$16 \$16 \$15 \$16 \$15 \$16 \$19 \$17 \$20 \$15
	G4 CCRRIDER CENTER WAT	7	195 19 77; Can Steward and the control of the control of the Contr
	GS CURRIDUR SOUTH DRT Go CURRIDUR SOUTH WRT	,	\$510 545 715 % 555 010 020 020 020 020 020 020 020 025 076 545 545
	Go CLERIDER SOUTH WET		\$50. 760 745 75. 54 No 120 000 100 100 100 100 115 1500
	GT AMBIE T DOT NORTH WALL OF WEST WING	,	150 for \$50 60 Fall for the see in 770 770 No 770 770
	GO AMBIENT AST NORTH WALL OF WEST PING	,	1/25 7 1 1/2 1/20 1/20 1/20 1/20 1/20 1/20 1/2
		1)
		1	
VERAGES		1	
AMBITTE	DRY BULF TEMPERATURE	1 .	\$5, \$50, \$50, \$55, \$65, \$66, \$66, \$66, \$66, \$66, \$76, \$76, \$76
omed at	WET BUID TEMPERATURE	1:	170 715 766 755 756 156 no 115 Me ME No 115 ME TS 75 765 750
	EFFECTIVE TEMPERATURE	1:	[0+ HT] 14 11 18 18 18 W. TT No TT 18 8 701 18 70 18 70 18 70 17 10
	SPECIFIC VOLUME	2220	INT MI MI TI The reader we at my at at at at MI I'm
	HUMIDITY RATIO	13.43	245 PEC 101 11 17 11 17 1 17 1 17 1 17 1 17 1
SMELTER	CRY BLIR TEMPERATURE		175 180 175 836 430 WE DO WE ARE ME HE ME ALE THE 150
	WET BLIB TEMPERATURE	1 7	\$15 FOR 18 30 - 420 or an a face was all as and all face for the fingless \$20 FLS \$25 FLS 10 58 as also a read as an are all face in \$25 FLS 286 \$4, 102, 15 FLS 18 FLS as a read as a read as a read as a read as \$25 FLS 286 \$4, 102, 15 FLS 18 FLS as a read
	EFFECTIVE TEMPERATURE	,	\$64,627,315 V.5 P. 1409 AV 200 AV AV AV AV AV AV AV AV AV AV AV AV AV
	SPEC PIC VOLUME	773/LB44	112 112 112 12 12 12 122 122 122 122 12
	PLMIDITY BATIO	18,118,	BOTTE, 6154E, 6512, ORDIN, and and and and and ana or or ordinate of the case
		1 -	E i i i i i i i i i i i i i i i i i i i
		1	l · · · · · · · · · · · · · · · · · · ·
VEATPER	BUREAU WIND VELOCITY	1	1 4 68 68 68 44 49 18 18 68 68 18 47 68 68 68 68 68 68 68 68 68 68 68 68 68
WEATHER	BUREAU WIND VETOCIAL	MPH	100 61 46 58 58 58 46 69 64 58 58 35 46 58 58 92
	WIND DIRECTION	1	feer one a sea son son one and an assession and from 1
30CF		of COUNTS	ATTO COTE OTTO USE ATTO AND ADDRESS OF OF OR AND ADDRESS OF ATTO
,,,,	CULATER REACING R	MEH	72 70 73 57,35 42 35 51 36 50 58 58 55 52 50 62
	WIND EMECTION		ATT - COTE OF THE CONTROL OF A STATE OF THE CONTROL OF A STATE OF THE COTE OF
	ATTO VELOCITY ITATLES WINDSC PE	MPH	4.0.7 5 / hard 6 to 6 6 7 4 Gard 7 1
	aliantefectit tratter appear and	mrn	The state of the s
		1	
IR FLOW PATE		CFM	11 4 Km 1-50 4.50 4.50 May have there there some some some some some 500 Mes 500
		1	· ·
NUMBER C	F WINDOWS ACTING AS INJETS EAST WINDOWS	1	ks s s s s, s s, s s, s s s s s s s s s
	1W W 10045	1	[]]]] [] [] [] [] [] [] [] [
	5* N7:00WS	1	[+ + + + + + 4] = [= [= [= [= 1]
		1	· ·
		1	k = 4 x x x x x x x x x x x x x x x x x x
		1	•
		1	
	TCR F F I M	1	0.0 - 241 010 (25017_01 024 012 01) 0 7 018 +15 019 224 016
Meninterin Eve	er rrm	1	and the second s
		1	
			,
		1	·
		1	L Company of the Comp
		F	
		1	4 · · · · · · · · · · · · · · · · · · ·
			↓
		1	
		1	
			·
T MAR T T	os kar nuura	PAGE	

<u>᠅᠘ᢤᡳ᠘ᢤᢢᡭᡭᡀᡛᡭᡭᢤᡭᢗᡭᡭᢗᢗᢗᢗᢗ᠘ᢢᢢᡧᡧᡧᡧᡳᡧᡳᡧᡳᡧᡳᡧᡳᡧᡳᡧᡳᡧᡳᡧᡳᡧᡳᡧᡳᡧᡳᡧᡳᡧᡳᡧᡳᡧ</u>

DISTRIBUTION LIST

ADDRESSEE			NUMBE	r of	COPIES
Assistant Director of Civil Office of Civil Defense Office of the Secretary of Department of the Army Washington, D.C. 20310		(Research)		12	
Defense Documentation Cent Cameron Station Alexandria, Virginia	cer			10	
Army Library, Civil Defens The Pentagon Washington, D.C. 20310	se Unit			2	
				•	
Stanford Research Institut 333 Ravenswood Avenue Menlo Park, California Attn: Mr. William L. Whit				2 	
U.S. Naval Radiological De San Francisco, California Attn: Mr. Paul E. Zigman	<i>,</i> .	pratory		1	
National Bureau of Standar Washington, D.C. 20325 Attn: Mr. P. R. Achenbach				1	
General American Research Attn: Mr. G. Engholm 7449 North Natchez Avenue Niles, Illinois 60648	Division			1	
Department of Mechanical E Attn: Prof. F. M. Flaniga University of Florida Gainesville, Florida	_			1	
Guy B. Panere, Inc. Attn: Director of Research 468 Park Avenue South New York 16, New York					
IIT Research Institute Attn: Dr. E. Sevin 10 West 35th Street Chicago, Illinois 60616					

ADDRESSEE	NUMBER OF COPIES
Department of Mechanical Engineering Pennsylvania State University University Park, Pennsylvania Attn: Prof. Elmer Queer	1
Department of Mechanical Engineering Attn: Dr. E. E. Drucker Syracuse University Syracuse, New York	1
Chief, Bureau of Yards and Docks Office of Research (Code 74) Department of the Navy Washington 25, D.C.	1
Division of Biology and Medicine Attn: Dr. C. L. Dunham U.S. Atomic Energy Commission Washington, D.C. 20325	1
American Institutes for Research Attn: Dr. James W. Altman 135 Bellefield Avenue Pittsburgh, Pennsylvania	
Hudson Institute Attn: Mr. R. A. Krupka Quaker Ridge Road Harmon-on-Hudson, New York	

.

Carmitu	

Security Classification				
	NTROL DATA - R&D			
(Security classification of title, body of abstract and index				
General American Research Div., GAT	. 24	Unclas	er security c	LASSIFICATION
7449 North Natchez Avenue	L_			
Niles, Illinois 60648	2'	b GROUP	•	
3 REPORT TITLE				
Natural Ventilation Test of an Above	ground Fallout S	helter	n Chicag	go, Illinois
4 DESCRIPTIVE NOTES (Type of report and inclusive dates)				
Interim Report				
5 AUTHOR(5) (Last name, Stret name, initial)				
Hemminger, Robert H.				
Madson, Charles A.				
6 REPORT DATE	78 TOTAL NO OF PAG	Es	70 NO OF RE	Ft
August 1966	81			
Se CONTRACT OR GRANT NO OCD-PS-64-201,	9ª ORIGINATOR'S REPO	NUM TRO	BER(S)	
(SRI) B-64220(4949A-16)-US	1268-81			
b. PROJECT NO	1			
c		49) 44		
•	Sb. OTHER REPORT NO	(3) (Any	other numbers th	st may be designed
d	None			
10 AVAILABILITY/LIMITATION NOTICES	1			
Distribution of this document is un	limited.			
				
11 SUPPLEMENTARY NOTES	12. SPONSORING MILITA			
	Office of Civi			
	Department of			
13 ABSTRACT	Washington, D.	C. 20	310	
	3		- ^~~~	n +-ma
The results are reported on a natur	al ventilation to	est or	a corrido	r-type
shelter located in Chicago. The ef when occupied at a density of 10 sq	rective temperati	are or	ill not ex	ceed.
33°F for more than seven days durin	uare reet per per a an average veam	r. Th:	is interim	report.
describes environmental tests perfo	g an average year rmed in a specifi	ic she	lter. The	
discussion of the results is prelim	inary and should	not b	e used as	
basis for general conclusions. A s	ubsequent final 1	report	will incl	ude
a comparative evaluation of data fr	om subsequent tes	sts ha	ving a var	1ety .
of configurations and locations.	•		_	
_				

DD .5084. 1473

10.00 M.Pr.

.

UNCLASSIFIED

Security Classification

Security Classification

14 KEY WORDS	LIN	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT	
		,	T				
CIVIL DEFENSE SYSTEMS			1				
	}	•	ł	1	.		
FALLOUT SHELTERS				1			
TESTS	Į.		l				
WIND	i		ľ				
TEMPERATURE]	}]]]	i	
HUMIDITY	1		1	1			
	ļ.		Į.		!		
VENTILATION		i					
		l	1	l			
	1	1	1	j		ĺ	
			1				
	Ì			1			
		1		İ]		
	1	i	1	1	1		
			1				
	l l				1		
	THICTIONS	1		<u> L</u>	<u> </u>	<u> </u>	

INSTRUCTIONS

- ORIGINATING ACTIVITY Enter the name and address of the contractor, subcontractor, grantee, Department of Defense activity or other organization (corporate author) issuing the report.
- 2. REPORT SECURITY CLASSIFICATION Enter the overall security classification of the report. Indicate whether "Restricted Data" is included. Marking is to be in accordance with appropriate security regulations.
- 2b. GROUP. Automatic downgrading is specified in DoD Directive 5200.10 and Armed Forces Industrial Manual. Enter the group number. Also when applicable, show that optional markings have been used for Group 3 and Group 4 as author-
- 3. REPORT TITLE. Enter the complete report title in all capital letters. Titles in all cases should be unclassified. If a meaningful title cannot be selected without classification, show title classification in all capitals in parenthesis immediately following the title.
- DESCRIPTIVE NOTES: If appropriate, enter the type of report, e.g., interim, progress, summary, annual, or final. Give the inclusive dates when a specific reporting period is covered.
- 5. AUTHOR(S): Enter the name(s) of author(s) as shown on or in the report. Enter last name, first name, middle initial. If military, show rank and branch of service. The name of the principal author is an absolute minimum requirement.
- 6. REPORT DATE. Enter the date of the report as day, month, year, or month, year. If more than one date appears on the report, use date of publication-
- 7. TOTAL NUMBER OF PAGES. The total page count should follow normal pagination procedures, i.e., enter the number of pages containing information.
- 75 NUMBER OF REFERENCES: Enter the total number of references cited in the report-
- 84. CONTRACT OR GRANT NUMBER. If appropriate, enter the applicable number of the contract or grant under which

8b, 8c, & 8d. PROJECT NUMBER. Enter the appropriate military department identification, such as project number, subproject number, system numbers, task number, etc.

- 9. ORIGINATOR'S REPORT NUMBER(S) Enter the official report number by which the document will be identified and controlled by the originating activity. This number must be unique to this report.
- 95 OTHER REPORT NUMBER(S) if the report has been assigned any other report numbers (either by the originator or by the sponsor), also enter this number(s).

- 10. AVAILABILITY/LIMITATION NOTICES. Enter any limitations on further dissemination of the report, other than those imposed by security classification, using standard statements such as:
 - "Qualified requesters may obtain copies of this report from DDC."
 - (2) "Foreign announcement and dissemination of this report by DDC is not authorized."
 - (3) "U S Government agencies may obtain copies of this report directly from DDC. Other qualified DDC users shall request through
 - (4) "U S. military agencies may obtain copies of this report directly from DDC. Other qualified users shall request through
 - (5) "All distribution of this report is controlled. Qualified DDC users shall request through

If the report has been furnished to the Office of Technical Services, Department of Commerce, for sale to the public, indicate this fact and enter the price, if known.

- 11. SUPPLEMENTARY NOTES Use for additional explanatory notes.
- . SPONSORING MILITARY ACTIVITY Enter the name of the departmental project office or laboratory sponsoring (paying (or) the research and development. Include address.
- 13 ABSTRACT Enter an abstract giving a brief and factual summary of the document indicative of the report, even though it may also appear elsewhere in the body of the technical re-If additional space is required, a continuation sheet shall be attached

It is highly desirable that the abstract of classified reports be unclarsified Each paragraph of the abstract shall end with an indication of the military security classification of the information in the paragraph, represented as (TS), (S), (C), or (U)

There is no limitation on the length of the abstract. However, the suggested length is from 150 to 225 words.

14 KEY WORDS. Key words are technically meaningful terms or short phrases that characterize a report and may be used as index entries for cataloging the report. Key words must be selected so that no security classification is required. Ideniers, such as equipment model designation, trade name, military project code name, geographic location, may be used as key words but will be followed by an indication of technical context. The assignment of links, rules, and weights is optional

UNCLASCIPIED

Matural Ventilation Test of an Aboveground Fallout Shelter in GENERAL AMERICAN RESEARCH DIVISION, GATC, NILES, ILL.

By R. H. Henninger and C. A. Madson August 1966 (UNCIASSIFIED), pp. 81 Interim Report 1268-81 OCD Work Unit 1214A

type shelter located in Chicago. The effective temperature of this shelter when occupied at a density of 10 square feet per person will not exceed 83°F for more than seven days during an average year. This shelter. The discussion of the results is preliminary and should not The results are reported on a natural ventilation test of a corridorinterim report describes environmental tests performed in a specific be used as the basis for general conclusions. A subsequent final report will include a comparative e aluation of data from subsequent tests having a variety of configurations and locations.

CIVIL DEFENSE SYSTEMS, FALLOUT SHELTERS, TESTS, WIND, TEMFERATURE, HUMIDITY, VENTILATION

Matural Ventilation Test of an Aboveground Fallout Shelter in Ghicaco, Illinois Ghicaco, Illinois GOD Work Unit 1214 GENERAL AMERICAN RESEARCH DIVISION, GATC, NILES, ILL.

By R. H. Henninger and C. A. Madson August 1966 (UNCIASSIFIED), pp. 81 Interim Report 1268-81

not exceed 83°F for more than seven days during an average year. This shelter. The discussion of the results is preliminary and should not The results are reported on a natural ventilation test of a corridorinterim report describes environmental tests performed in a specific be used as the basis for general conclusions. A subsequent final report will include a comparative evaluation of data from subsequent type shelter located in Chicago, The effective temperature of this shelter when occupied at a density of 10 aquare feet per person will tests having a variety of configurations and locations.

CIVIL DEFENSE SYSTEMS, FALLOUT SHELITERS, TESTS, WIND, TEMPERATURE, HUMIDITY, VENTILATION

Ventilation Test of an Aboveground Fallout Shelter in GENERAL AMERICAN RESEARCH DIVISION, GATC, NILES, ILL Natural

OCD Work Unit 121 Chicago, Illinoi

By R. H. Henninger and C. A. Madson August 1966 (UNCLASSIFIED), pp. 81 Interim Report 1268-81

not exceed 83 F for more than seven days during an average year. This shelter. The discussion of the results is preliminary and should not The results are reported on a natural ventilation test of a corridorshelter when occupied at a density of 10 square feet per person will interim report describes environmental tests performed in a specific report will include a comparative evaluation of data from subsequent type shelter located in Chicago. The effective temperature of this be used as the basis for general conclusions. A subsequent final tests having a variety of configurations and locations.

CIVIL DEFENSE SYSTEMS, FALLOUT SHELTERS, TESTS, WIND, TEMPERATURE, HUMIDITY, VENTILATION

Natural Ventilation Test of an Aboveground Fallout Shelter in GENERAL AMERICAN RESEARCH DIVISION, GATC, NILES, ILL, Chicage, Illinois OCD Work Unit 1214A

By R. H. Henninger and C. A. Madson August 1966 (UNCLASSIFIED), pp. 81 Interim Report 1268-81

shelter. The discussion of the results is preliminary and should not The results are reported on a natural ventilation test of a corridorinterim report describes environmental tests performed in a specific be used as the basis for general conclusions. A subsequent final report will include a comparative evaluation of data from subsequent type shelter located in Chicago. The effective temperature of this shelter when occupied at a density of 10 square feet per person will not exceed 83°F for more than seven days during an average year. tests having a variety of configurations and locations.

CIVIL DEFENSE SYSTEMS, FALLOUT SHELTERS, TESTS, WIND, TEMPERATURE, HUMIDITY, VENTILATION